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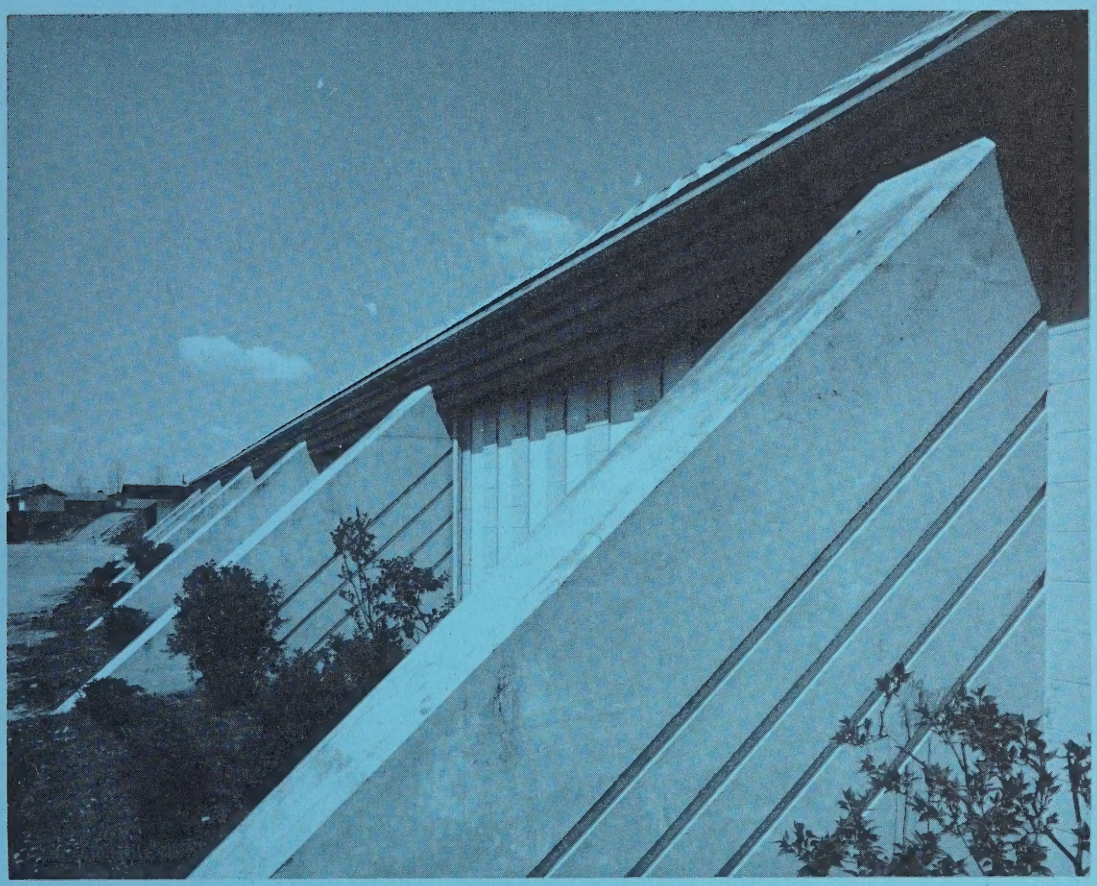

DESIGN AND CONSTRUCTION OF ARENAS

This manual has been prepared by the Youth and Recreation Branch of the Ontario Department of Education with the assistance of funds made available through the Federal-provincial Agreement on Fitness and Amateur Sport.

Further information on the planning, design, construction, operation and programming of recreation facilities may be obtained through the District Consultants of the Youth and Recreation Branch. The addresses of these offices are listed in Appendix II.

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INTRODUCTION

Nearly every Ontario municipality, rural or urban, provides some facilities for its citizens to skate, play hockey and curl. Older buildings may be designed chiefly to accommodate hockey programs and provide for public skating. The most modern arena may be part of a recreation complex made up of multi-purpose structures ingeniously designed for a great variety of year-round activities.

Whenever an arena is to be built, or an old structure is to be renovated, sound decisions must be made; careful planning and objective evaluation of the project must be undertaken at every stage — initiating the idea, collecting the facts, planning, financing, promotion, programming, operation. This manual is intended to provide some of the background information needed for decision-making. The material is based on recent experience in a good many communities in Ontario.

● The Idea Stage

What this community needs is a good arena! The idea may come from a group of articulate, sports-minded citizens, be developed by stories in the local paper, win the support of some energetic groups such as service clubs, and eventually come before council as a proposal.

The idea has the best chance of materializing when it has the support of the whole community.

● Getting the Facts

A committee is often set up to study the "feasibility" of the project, and to bring together all the various approaches and needs that are being expressed in the community. Such an arena committee may go on, after the members are convinced that the project should be carried out, to outlining plans for a building that meets the needs of the community and for which there are financial resources.

At this stage the committee may decide they need the help of experts. They usually enlist the services of any people of the community who are specialists in finance, promotion, construction and recreation. The members may feel that it is not too early to consult a designing-architect. Great care should be taken in the selection of the designer (see page 7).

To prepare the base for a good design and a good plan there are many questions to which the committee must supply precise and adequate answers:

What is the basic purpose of the arena? Will it be used mainly for spectator sports, or mainly for participation sports? Or a combination? Will it be used for summer activities as well as winter sports?

Is the arena to be part of a larger complex of recreation facilities that may include a community centre, playfields, swimming pool, auditorium, and so on?

Will the arena building be expected to provide for activities that require a stage and auditorium seating?

What population will be served? What distances will people travel? How will the arena relate to existing recreation facilities?

What sites are available? Are all the facts needed for the selection gathered together – land cost, drainage, utilities, zoning regulations, adjacent parking, and so on?

What financial resources are available? Will it be necessary to build in stages?

How will the arena be managed once the building is complete and the planning committee has turned it over to the permanent operating group and the community? What staff will be available for maintenance and programming?

The arena planning committee should from the first include in its membership people of the community who can provide guidance and information about the recreational needs of the community.

The material for this manual was prepared by Professor J. R. Wright, School of Landscape Architecture, University of Guelph. He acknowledges the assistance of members of the Ontario Arenas Association Inc., and the co-operation of several commercial firms.

The Ontario arenas were photographed by Dave Manore.

● Type of Structure

The type of structure to be built will be one of the first discussion points and should receive the most serious deliberation. Upon this decision will depend the anticipated building costs. The type of structure is determined by the anticipated activities and programs for the arena. While this might appear obvious, there will be major differences in sizes of dressing rooms, seating, heating, and so on according to the type of program in minor or senior hockey, and depending whether events other than hockey will be promoted, either winter or summer. There is also a fundamental policy that must be determined at this stage; on whether the arena is to be a commercial type revenue-first operation, or whether it is to be used for public recreation purposes and profit only a secondary consideration:

- Is the arena to be subsidized by the municipality, break even, or make a profit?

- Are debenture charges to be paid out of gross revenue or charged against the annual current municipal tax levy?

The answer to these questions may have considerable effect on actual architectural design and layout, and should be thoroughly discussed and decided upon at the very outset of the planning process. To side-step these issues is unforgivable and may eventually prove most embarrassing to the arena managing authority or the local municipal council.

● Committee Structure and Managing Authority

The onus for a building campaign is often placed upon an existing recreation and/or parks commission, if such exists within the community. If such a board is not in existence, then a group of citizens must carry out this function. Indeed, if funds from various provincial sources are to be realized, such a committee is mandatory, since grants rising out of the Community Centres Act are not paid to individual organizations, only to a municipality. This Act requires that a board of not fewer than three ratepayers be appointed by the municipal council to administer the arena. However, prior to receiving such grants, the planning and promotion of an arena may evolve through different types of community organizations.

The Community Centres Act of Ontario defines "community centre" as a community hall, athletic field, indoor or outdoor swimming pool, skating arena or outdoor skating rink.

Section 6 of The Community Centres Act outlines in parts (1), (2) and (3) the appointment and composition of a board. Section 8 states that grants may also be made to school boards, as well as the municipality. Some communities set up an arena board, as well as a recreation and/or a parks commission. The Act is quite clear that one board or commission is all that is required to satisfy the terms of the Act. Some communities may have two or more boards, but the same members comprise both boards, and the arena manager and the recreation director may be the same individual carrying both responsibilities.

It seems only logical, that a single board or commission is the most judicious and efficient system. It permits managerial direction of the arena and other community recreational facilities to be co-ordinated in a non-competitive sense, and in the best interests of the public at large. There is a definite trend to one board managing all community recreational facilities and programs, including arenas and other community centres. The most obvious advantage of such a combined board is the simplified administrative control for a year-round community recreation program. As the size of the community increases, an arena will require a manager on a year-round basis, but the board structure remains as described.

Such a committee should represent the thinking of the municipality at large. The membership may be composed of representatives of service clubs, the recreation and/or parks board, the fair board, board of education, and should always have representation from the local council. The committee should not be over 11 or 12 persons. An unlimited number of persons may be added to various sub-committees, such as finance, promotion, building, etc. The chairman for each committee should be a member of the main arena committee. This main committee must have final and positive authority and clear all sub-committee recommendations prior to their implementation. Such a planning committee, may or may not be appointed as the operating authority and may function as an interim committee until such time as the arena operation is turned over to the managing authority.

Objectives of Committee

Notwithstanding the composition of an arena committee, the basic purpose or objective of this group should be self-evident. To ensure that there is a clarity of purpose, the basic objectives of the committee should be agreed upon in writing. While this initial step may appear superfluous, it is, in fact, much more important than is generally recognized. The basic reasons for construction or replacement, when agreed upon by the members of the committee, can be referred to as the guideline to the group, when and if persons, or even

members of the committee, attempt to move in a direction not contained within the basic purpose. When one considers that public funds and personal donations are being expended, that alone should be sufficient reason for protecting the committee, should any question arise from the general public as to the reasons for the type of structure. Such a statement may be short, but essentially should contain the fact that a building to suit a particular need or various needs (itemize type of activities) is agreed upon. The other key reason is the fact that agreement on such a statement is extremely helpful in resolving the real needs of the community as expressed in such a facility, and will help resolve the question of off-season uses, expected sources of revenue, etc.

Selection of an Architect

An architect, conversant and experienced in arena design, can definitely save the community both time and money in the design, construction and operational phases. This statement is especially true in the urban areas, where building codes and fire regulations are usually much more severe than in rural municipalities. On the other hand, there are many smaller size arenas that have been constructed without the services of an architect. In these cases, plans and general guidance are usually provided by a commercial firm which is supplying a major portion of the materials or the refrigeration equipment. In almost every case it should be noted, an experienced local contractor or responsible building supervisor has assumed full authority for the construction phase with the backing of a very well qualified building committee. Occasionally local carpenters' have attempted to supervise such construction without having any previous experience. The results are sometimes sad and lead to added costs.

Ideally, an architect is selected to design the building and in turn secure the services of any necessary professional advice, such as mechanical, heating and refrigeration consultants. It is to the credit of the various larger refrigeration firms in Ontario, that these firms provide much excellent technical advice and guidance to the committee as well as the architect, at no extra charge over and above the cost of their materials. The same can be said for the firms supplying structural roof members for the building. But the committee should not expect these firms to assume the position of designers and building contractors, and should only depend on such advice in the fact gathering planning stages.

The important point that cannot be over-emphasized is that an arena is a costly and complex design problem involving public funds. An architect or designer should be experienced and must be carefully selected for his professional reputation and overall competence. Should a local architect be considered, that has had no previous arena design experience, it is mandatory that he become familiar

with other arenas in other municipalities to avoid serious design errors.

An engineer or architect in the employ of a municipal department, such as public works, is sometimes utilized as the designer. Great care should be exercised to ensure that full discussion and communication are maintained between the expert and the arena planning committee; he must remain the servant of the arena planning committee. Such a public employee, while fully competent in his normal work, may be completely unfamiliar with functional features of the particular design, but he can be extremely useful in the supervision of the construction phase of the arena, provided he admits to his limitations of experience.

Design and Cost Estimates

The various architectural stages of design are important to the arena committee. After the necessary interviews and fact gathering, the preliminary outline or draft plan is prepared and presented to the committee for a full discussion. It is at this point the committee should thoroughly check the overall concept as to circulation, access, seating arrangement, number and size of dressing rooms, storage, vehicular access, or the overall general relationship of the building to anticipated functions. When this plan is approved, the architect is given formal approval to proceed with the detailed plans. The committee then checks the plans for such details as location of switches, the PA system, heating, lighting, floor surfacing, paint colours, number of washroom facilities, concession location and design, refrigeration features, storage, janitorial space, foyer and ticket booth relationship, size of corridors, types of seats, and so on. The future operation and maintenance problems should be kept uppermost in mind at this point. A review of section 3 in this booklet will provide further features that should be checked. When all criticisms and details have been clarified or modified to suit the committee, the architect proceeds with the final detailed plans. It is at the plan checking stage, the value of an experienced arena manager is of inestimable assistance, especially if he has been employed at this stage. Often, his assistance in anticipating future operation efficiences will more than pay his salary.

Fund Raising and Promotion

There is no general pattern or formula that explains or indicates the method of fund raising in any single community. Some communities have raised sufficient monies to eliminate any need of debentures. In some communities, one prominent industry may provide a very substantial percentage of the required funds, while this does not happen in another. In many smaller communities, there is very

A Large Arena

often an almost total contribution of labour by local persons, with only the building supervisor receiving wages. Sometimes a municipality will act as the general contractor and employ the sub-trades. Most larger urban areas now assume the total cost of the structure by debentures, no plebiscite being required for such action.

The capital or building funds are realized from various sources. The following are the principal sources of fund raising.

Municipalities

(i) Government Grants — funds are available through the provincial government for arena construction. The Community Centres Act permits a grant of $10,000 or 25 per cent of the cost of a building or part of a building designed for a community hall or skating arena. Grants may be made to assist in the construction of more than one community centre, and where the building is designed to include both a community hall and a skating arena, the grant may be up to 25% of the total cost of the building, or a sum not to exceed $20,000. The hall must meet the same requirements as if it were built separate and apart from a swimming pool or public auditorium. All such grants are paid directly to the municipality.

(ii) Municipal Debentures — the total sum, or a portion of this amount may be secured through municipal debentures taken out over a protracted period of time (i.e. 15-25 years). In Ontario, many municipalities are not in a position to carry the full debenture for an arena, being restricted by law or other community financial commitments.

(iii) Cash Reserves — a municipality may utilize funds from cash reserves realized from various sources. A portion of these reserves may be available for arena building purposes.

Large Gifts

Many commercial and industrial firms, service clubs or private individuals or organizations may contribute an inordinate financial gift to the building fund. Donations may be in the form of goods or materials in a significant quantity, or at a greatly reduced price. By this latter method, lumber, concrete blocks and bricks, heating equipment, seats, time clock and similar materials may be obtained as a donation or at a moderate cost. This procedure is most common in smaller or rural communities.

Subscription

Funds are donated by private citizens, clubs and organizations, commercial firms and industries, as a lump sum, but preferably pledged over a 3-year period. A pledge usually results in a larger donation than a single cash payment.

Special Events and Methods

Events such as dances, barbecues, variety shows, auctions, bingos, athletic events and tournaments are very often an excellent source of funds. These events may be sponsored by the arena committee or a local service club. Another successful method is where the public is asked to purchase a concrete block (for say $100) or a number of blocks. Those so contributing in this manner have their name inscribed on a plaque in the foyer, thus providing a tangible aspect to such a fund-raising method.

Promotion

One of the basic elements that is so necessary to the success of an arena building campaign lies in proper use of various promotional techniques. The local newspaper can be a real asset to the committee, as can a local service club or clubs. A well-executed model of the arena and the adjacent property can be utilized to great advantage by the arena committee. People appreciate viewing such a model, as it explains much more than can be described verbally. Service clubs may arrange for such a layout as an aid in the promotional campaign. While a model can be fairly expensive, depending upon the desired quality desired it is an extremely wise investment under almost any circumstances.

Tenders for the Contracts

The arena plans are advertised and bid on by interested contractors. This practice is sometimes altered in that the local municipality handles the general contract through its works department and sub-contracts various phases of the job.

Tenders can only be called, based on a carefully prepared plan and detailed specifications, as prepared by an architect or engineer. In tendering, several types of bonds are usually required.

Bid Bonds — The bid bond is submitted with the contractor's proposal or bid, and is a guarantee that the bidder will enter into the contract if his proposal

Two
Small
Arenas

is accepted and also guarantees that he will furnish performance and payment bonds. If the bidder refuses to sign the contract in accordance with his bid, he may be subject to a penalty of from 5% to 10% of the bid amount.

Performance Bonds — This bond guarantees that the contractor will perform the contract in accordance with its terms. It usually covers all work obligations as in the contract, including protection against defective work by the contractor. A payment bond may also be asked for guaranteeing that the contractor will pay for his labour and materials.

Other Bonds — Penalty clauses are often included in a contract, but appear difficult to enforce by a municipality. A reputable contractor with reasonable co-operation from the sub-trades, attempts to complete any job within as reasonable a time as possible, as extra time can reduce most, if not all of his profit.

A surety bond is a contract between the surety and the owner in which the surety promises to make good a deficiency on the part of the contractor.

The bond system has been recognized as a stabilizing and positive factor in the construction industry, both eliminating fly-by-night operators and protecting legitimate construction firms. For further details on tendering, bidding and contract agreements, a qualified engineer or architect should be consulted as this tendering phase requires the best possible advice.

● Construction and Supervision

After the contract has been let, and before construction actually begins, definite arrangements should be made by the owner (municipality) to oversee or supervise the construction project. Should the municipality act as its own general contractor, it is in effect its own contractor and own supervisor, probably relying on outside assistance from various sources. This method is usually only common to smaller or rural type arena projects, where funds may be short and there is voluntary donation of both labour and materials, not evident in larger centres.

The normal procedure in the majority of arena building undertakings is by one of three methods -

1. supervision by the architect
2. supervision by the municipality
3. supervision by a combination of (1) and (2)

The architect, on an agreed fee basis, may be assigned the responsibility to ensure that the terms and specifications of the plans are adhered to by the contractor. The municipality may assign their own engineer and/or public works director to act on their behalf, or, very often, the architect and municipal engineer are jointly responsible for this.

The importance of this supervision cannot be overstated. With no supervision, or inspection of this nature, the municipality is open to the possibility of the use of sub-standard materials and as important, poor or inferior workmanship. Often, the arena board assigns their manager (or recreation director) to accompany the inspectors as required. His experience in other similar projects can be invaluable and ensures that the contract is adhered to in the best interests of the community and the public funds involved.

There may be various municipal by-laws or other regulations that apply to the contractor as to union regulations and fair wage practices. Such further information may be secured from the clerk-treasurer of the municipality, or the public works engineer. Any work changes, material substitution, etc., should be in writing to avoid future problems. Most contracts include stipulations as to work progress reports, system of payments to the contractor, final inspection, and hold-back payments, as well as any guarantee on the arena construction (usually one year).

Construction Costs

The overall capital costs of an arena should take into consideration the following:

- preliminary planning costs (promotion, brochures, soil testing, etc.)
- land acquisition (if necessary)
- architectural and engineering fees (usually 6% of gross cost)
- cost of building including refrigeration plant, seating, office furniture, etc.)
- supervision of building construction
- parking lot - surfacing and drainage
- utilities (sewers, water, electricity, gas) outside the building
- extra and miscellaneous items (from 10-15% as a safe estimate)
- landscaping of property

Roof Structure

Structural Safety

The structural safety of the completed arena is of top importance in the future operation and general safety of the patrons of the building. Most municipalities, if they do not have their own building code, use the National Building Code of Canada, obtainable from the National Research Council, Ottawa. Local building codes generally follow this Code in considerable detail, but the building regulations vary in Ontario in relation to the size of the municipality. The larger the population, generally speaking, the more stringent are the regulations while the opposite is true in most small to rural areas. In arena construction, if the building is not designed by a professional architect, then advice should be obtained as to structural strength from a professional engineer. The Canadian Standards Association regulates loading requirements for laminated and steel members for the arena superstructure.

Snow-load

The major reason for this advice is the matter of snow-load. There have been many instances in former years in Ontario of arena roof failures from snow overload. Adequate structural design to prevent such occurrences is now fundamental in any building. Supplement No. 1 of the National Building Code lists the various snow-loads for most municipalities in Ontario by showing the lbs. per sq. ft. required in any roof structure. Examples, showing the vast differences in Ontario are illustrated as follows by the ground snow-load data:

	Ground Snow-load
Ottawa	60 lbs. per sq. ft.
Kingston	50 " " "
Toronto	40 " " "
Guelph	60 " " "
Fergus	106 " " "
Windsor	22 " " "
Mount Forest	110 " " "
Huntsville	104 " " "
Sudbury	55 " " "
Owen Sound	87 " " "

As an example of snow-loading problems, roofs having a valley where a large roof intersects a low roof may have to carry up to three times the depth of snow on the ground. Melting and subsequent freezing can result in an extremely heavy load.

Other loads to be considered are wind, earthquake, earth pressure, expansion and contraction of building and sway impact. For example, a 60 mph wind is equivalent to 10 lbs. per sq. foot while a 120 mph wind is equivalent to 40 lbs. per sq. foot. The validity of professional guidance on structural strength should be evident.

Fire Regulations

The National Building Code Fire Regulations work in conjunction with the Building Regulations. These regulations govern the type of materials for various size buildings. width and number of exits. They also specify that the boiler room, electrical controls and refrigeration plant must be separate and self-contained rooms with walls that have a "three-hour rating" (i.e. 10" concrete and steel doors). If dressing rooms are in a basement, there must be two exits, one directly to the outside. A recent innovation in many U.S. arenas is to locate the refrigeration ammonia shut-off valve outside the building, reducing danger of explosion and reducing fire premiums.

The arena is considered in terms of fire resistant materials. For example, wooden laminated arches are combustible, but stand up longer than steel girders under similar fire conditions, as steel loses 2/3 of its tensile strength at 1,000° of heat. This factor will influence the cost of fire insurance but is considered along with other items such as seating, where wooden seats on concrete or steel greatly reduce fire premiums compared to wood on wood. One recent example in Ontario shows that a change from wood to concrete as a base for seating, along with other minor changes, reduced the fire premium from $7,200 to $3,000. The fire hazard is the key to determining fire insurance rates set by the Underwriters Laboratories of Canada. The inclusion of a sprinkler system in the various arena areas can greatly reduce this fire hazard, hence a lowering of premium rates. This saving, as a rule, can pay for the added features in a few short years as well as giving added safety to the public.

An architect is familiar with these building and fire codes and will include these requirements in the design. If a community does not employ an architect any plans should be forwarded to the Ontario Fire Marshal's Office, the Attorney General's Department, Toronto, for a check on these regulations. In municipalities having a fire department, these items can be checked by the chief.

Many communities have their own fire by-law, patterned after the National Fire Code.

Other Regulations

Most municipalities have local health regulations that affect sanitary conditions in the washrooms, as well as food and beverage outlets. There may be other local by-laws in regard to exterior finish, parking requirements, and so on, that will affect the design and cost of the arena.

Dedication Ceremony

To ensure that all of the requirements of the contract have been completed by the contractor, the building is opened for public use only after the architect or supervising authority has completed the final inspection of the building and site. The opening ceremony is worthy of considerable promotion, considering the total community effort to realize the final goal, the actual daily use and operation of the arena building.

Summary — Steps in Arena Planning

1. Idea — We should have an arena!

2. Review and study needs — What other facilities are needed in the community?
   — How important is an arena in meeting the community's recreation needs?

3. Committee structure — Arena committee chosen to represent a cross section of community leaders and groups.

4. Co-operative planning and citizen participation — Involve as many persons as is reasonably possible.
   — Inform people and discuss the project as widely as possible.

5. Preparation of arena objectives — A statement in writing to explain and state the purpose and activities intended in the arena project.

6. Architect employed — May be considered at stage 4 or 5, depending upon

Summary (continued)

6. Architect employed — suitability and past experience of the architect

7. Preliminary design and cost estimates — schematic and preliminary plans
   — capital and annual budget projections

8. Approval of final plans — by committee and local elected council
   (if necessary)

9. Fund raising and promotion

10. Working plans and specifications

11. Final check on plans and specifications — especially as to overall layout, materials and traffic circulation, operational and maintenance efficiencies

12. Tenders, bids, contract letting

13. Construction and supervision

14. Dedication ceremony

Notes on Construction Costs

Table I shows a breakdown of the major cost elements involved in arena construction. Please note that these should only serve as a guideline, as costs vary excessively in different sections of the province. It is to be noted in this table that the % cost of the roof structure increases as the building size increases. This is also true of the ancillary structures to the main ice area. Refrigeration costs tend to be more uniform for all arenas, extra costs becoming apparent due to an increase in normal ice requirements.

Table I

Major elements of arena shown as % cost. (Does not include architectural and supervision fees — approximately 6%-8% of total overall expenditure.)

Elements of Arena	Approximate % of overall cost for various arenas		
	$300,000	$200,000	$100,000
1. Major roof structure and seating area	34	25	17
2. Entrance foyer, office, dressing rooms, service areas, mechanical equipment & storage space, etc.	30	25	17
3. Mechanical — heating & boilers, etc.	8	10	14
4. Electrical — wiring & controls, etc.	8	10	14
5. Refrigeration equipment including ice cushion and boards	18	27	35
6. Grounds — parking lot, turf, plant materials, sidewalk, etc.	2	3	3

While some gauge of overall construction costs can be given as a preliminary cost guide, no accuracy or dependability on this estimate is possible prior to the design stage, because of the great number of variables involved in the structure. These variables are not encountered, in most cases, until a preliminary plan is prepared and a cost estimate taken off. It is well to remember that the costs

of the roof structure rise disproportionately to the increase in seating area. As the width of the structure increases, costs tend to rise in a geometric, rather than arithmetic sense. The unit cost of the arena is lowest over the actual ice surface. The greatest added cost to arenas is a result of large seating capacity and the ancillary structures required to serve the main ice surface

Costs of arenas reflect the local labour costs as well as type of materials and function of arena. In small, rural communities there is often a great deal of voluntary labour donated. There can also be a saving in donated materials or materials supplied at a below normal wholesale price. As the size of communities increases and building regulations become more stringent, costs increase. This would indicate why there can be as much as four or five dollars per square foot added as a cost factor in larger communities. One must also realize that since 1965, prices of materials have increased greatly, the sales tax has increased, and labour costs have increased much more than in other recent periods.

A properly designed arena, having 6 dressing rooms and seating 1,000 persons could, for example, very easily cost $12 to $13 per sq. ft. at 1964 labour and material costs. In 1967, these costs are $18 to $22 per sq. ft. for a smaller arena and up to $45 or more per sq. ft. for a large structure.

Extreme precaution should be exercised in attempting to build to a pre-conceived cost estimate, rather than designing for functional use in order to arrive at a cost estimate. While savings in original capital expenditure may appear necessary, these savings are often proven shortsighted and considerable extra expenditures are generated through use of renovations and repairs found necessary due to original constructional shortcomings.

It is difficult to predict arena construction costs prior to the design stage. This is because of the great number of variables that are involved in such a building. Costs rise significantly with an increase of seating accommodation due to the increased width of the arena resulting in a heavier and longer roof span. The number of dressing or other meeting rooms add to the cost factor, and whether or not summer ice is required.

ARENA LOCATION AND SITE CONSIDERATIONS

The matter of relating the intended uses of the arena to the design is now the responsibility of the architect and the planning committee, having decided and agreed upon the type of facility and its key functions. At this point, many committees assume that their lack of knowledge of architectural design should absolve them from any responsibility in the design stage. A qualified architect will insist upon close liaison with the arena planning committee in the interests of the best possible end product. This is not to suggest that every detail of the design must be approved in the initial stages, but that at each logical stage of development the committee should be given an opportunity to discuss the details and the implications of the design. The following should be fully discussed:

The overall site plan and the relationship to the adjacent site and facilities.

The actual building layout as to overall size and dimensions showing relationship of entrances and exits to the parking lot and public transportation.

Zoning — The architect will ensure that any existing zoning by-laws are adhered to or any regulations as to type and size of building, amount of vehicular parking, and so on will have been discussed and cleared with the proper civic officials. While many smaller communities are not concerned with this matter, this is a normal procedure in larger urban areas. Often proper and attractive design features will overcome many of the objections to such a large facility being placed in certain areas. The old traditional steel-roofed barn-like building is understandably objectionable in an area of good quality housing, as opposed to some of the finer architectural renditions that have been designed and constructed in recent years and built in proximity to residential areas. It should be recognized, however, that proper zoning regulations will by and large prevent conflicts in this matter, as zoning is intended to promote the highest and best land use of the various sections of the municipality, taking into account all these delimiting factors.

● Building and Fire Regulations

The architect or the local planning committee have an obligation to ensure that any and all local municipal building and fire regulations are adhered to. This is a customary procedure involved in any building construction project and is intended as a protection to the safety and health of the citizen at large. These regulations vary depending upon the size of the community and upon criteria such as number of seats, type of intended uses of the arena, proximity to other

structures and water outlets for fire protection, and so on. The type of regulations may have a considerable bearing upon the final overall construction costs and are a key factor in the determination of the final anticipated arena cost. The regulations could well affect the type of materials and fixtures, and hence require a much higher quality for such items.

Drainage Factors

The drainage of the overall site, including the parking lot and adjacent amenities, has been sadly neglected in the construction of many arenas when there are no local regulations or by-laws drawing attention pertaining to surface run-off. In the final selection of the building site, every precaution should be taken to ensure that both the actual arena site as well as the adjacent grounds receive sufficient drainage treatment. Normal site feasability requires two approaches -

1. Soil-testing of the building site to determine soil conditions and sub-drainage that indicate the type of footings or structural support that will be required, and that will also determine any source of underground water that could result in future maintenance and upkeep problems.

2. Surface drainage considered in terms of existing grade of the overall site with any necessary changes in grade to be indicated on the site plan, along with necessary storm sewers and catch basins. This precaution could well be a judicious investment in preventing future costly flooding problems especially during the spring season.

Utilities and Services

The proximity and/or the type of utilities and services that are available for the arena may be a strong determining factor in final site selection. By utilities and services are meant water, storm and sewer drainage lines, electricity, telephone and natural gas lines. Since water and electricity are two prime requisites to any arena, these must be available in the nearby vicinity of the intended location. If water is to be brought into the building, a water pipe-line can be a costly feature if it is not located within a reasonable distance from the site. The possibility of a drilled well in a rural community or smaller town has often proven to be a low cost building and maintenance feature. The cost of water supplied by the local municipality can influence the type of refrigeration unit to be installed. If water is to be a relatively high cost factor, an evaporative unit should be considered to reduce future operating costs. A further discussion of the type of refrigeration required will clarify this point, in a later section of this booklet. If a septic

Landscaping

tank sewage disposal system is to be used, consideration of the soil type is essential to ensure effluent carry-off, and to ensure that no rock outcrops or similar conditions might create costly excavation problems.

Direction of Building

The siting of the actual building in terms of climatic factors is not nearly as important as is the case for a natural ice arena or for an outdoor artificial ice cushion. Whereas the direction of the sun and prevalent winds is a factor in siting, the access to parking and general aesthetics of the building location are more important in a modern, well-insulated arena facility. In the case of a very low cost type of building where perhaps there are few, if any, seats along the southern side of the building, consideration should be made to alleviate this situation. It is well to design a corridor or concourse between the rink boards and the outside wall on the south side of the building to reduce radiation of the sun's rays and prevent soft spots or water occurring against the boards. This problem has been overcome in some cases by planting coniferous (evergreen) plant materials four or five feet from the side of the building. In areas of considerable snow fall, this problem may be largely overcome as snow builds up against the south wall and acts as an insulating medium. However, one cannot always depend upon snowfall to prevent this problem occurring.

Strong and gusty winds, that are prevalent in the region, may result in locating the major entrance and foyer in a more favourable direction. If it is possible to locate the long building axis in a N-S direction, there could be advantages, especially during the early and late season periods as temperatures are of such a nature to create freezing and thawing problems along southern exposed areas, at doors and entrances. This condition can lead to heaving and even flooding.

Parking

The amount of parking space required will, to a large degree, depend upon the type and number of activities and events that occur in the arena or perhaps in other related activities or facilities that take advantage of a common parking area. To provide an unusually large amount of parking space for events that draw large crowds only on occasional times, is, of course, unrealistic. However, the site must provide sufficient or reasonable space for normal activities with some measure of anticipated special event demands reflected in space used occasionally to full capacity. Other factors influencing parking demands are cost of land, related recreational facilities, public transportation, adjacent parking facilities for use at peak or over-flow periods (such as shopping centres, public

parking areas, etc.), to mention a few.

General Rules for Vehicular Parking

- Allow one parking space for each three patrons (for normal attendance)
- Allow 400-450 sq. ft. per vehicle for parking space which provides parking for over 100 cars per acre.

Public and Service Entrances

While these factors as related to building design will be discussed in detail in a following section, it is important to realize that the entrance and service areas are strongly related to the general site in terms of accessibility and convenience. It is well to remember that the public entrance creates the first impression on the general public, and a poorly located entrance is not conducive to an initial positive response by the visitor. An entrance oriented to the parking area is of real value in providing a more efficient arrival and departure of the arena patrons. The service entrances should take into account the delivery of many items for normal operational use, necessitating wide and ample room for trucks and large vehicle convenience. There should also be sufficient outside areas provided for the unloading and easy access of materials and vehicles for special shows or events. There are too many examples of large service doors opening to a small lane-way or opening to an area that is both difficult to locate and to manoeuvre a large truck or similar vehicle or equipment.

Landscaping

Unfortunately, landscaping of an arena is often treated as a consideration only if there are a few spare dollars remaining after the building is completed and someone thinks that a sidewalk or some grass might improve the major entrance. In too few instances, the overall appearance is considered in terms of the aesthetic qualities of the total site. When this has been considered, along with the siting of the building, appearance and quality of building materials, ease of entrance access and exits, and necessary landscape materials placed in respect to the total site, then a most favourable overall quality is imparted. Attendance and local public support, provided there are reasonable attractions, cannot be divorced from the subject of overall landscape and site quality.

Arena landscaping is not merely the growing of grass and the placement of a few shrubs and trees at the entrance to the building. It is the enhancement of the

total area by strategically placed landscape materials that may include turf, plant materials, paving, exterior lighting, parking, benches and fencing, etc., all in harmony with, and complementary to the siting of the actual arena. The building and the overall site should be treated as a single design problem relating the arena to parking, access, utilities and final landscape improvements. In far too many cases the grounds and the building are treated as separate and distinct entities, when, in fact, they are integral parts of the sum total of the overall property and the immediate neighbourhood.

The access and exit areas must be carefully considered with ample hard surface areas to prevent the undue and unwarranted use of turfed areas resulting in a run-down and neglected appearance. Carefully designed, a minimum amount of turf and plant materials can be tied in to the hard surfaced areas to create a most pleasing and attractive site.

The arena should be considered in relation to other community recreational areas and facilities. A properly and well-designed site can add immeasurably to the overall community appearance.

DESIGNING THE BUILDING — CONSIDERATIONS & PRECAUTIONS

We shall assume that the architectual design recognizes the intended activity and programmed use of the arena. We will deal in a general sense with the major arena design details that are not only important in the original lay-out and construction but are critical in the proper functioning and operation of the arena as well as the maintenance and upkeep of the structure. Poorly designed structures are not only frustrating to the operator and its patrons, but always expensive and often impossible to renovate or remedy. The planning committee has a major responsibility to screen out as many of these "bugs" as possible, prior to final approval of the building plans and prints.

● Type of Building Structure

The type of building design and main arena superstructure depends to a large degree upon the intended function of the arena, the critical factor being the number of seats required in the main auditorium. There tends to be little relationship between the population of the municipality and the size of the arena, or the number of seats. Local demands vary greatly in various communities.

The following sample shows this relationship for a number of Ontario centres:

Population of Selected Municipalities in Ontario	Capacity		
	Total	Seats	Standing
7,000	2,415	1,515	900
9,200	3,300	2,800	500
9,500	2,200	1,400	800
10,000	2,415	1,515	900
15,000	2,400	1,400	1,000
17,500	2,500	1,000	1,500

Since 1945, a great many arenas have been built in Ontario, especially in many rural areas and small to medium size villages and towns. One particular style or design is very common, being a laminated wood-truss, hip-roofed structure suitable for upwards of several thousand seats capacity. There have been many recent modifications to this basic design unit, especially to the entrance and foyer sections that have been adopted to meet different needs of a particular community. This particular design has, by and large, proven to be very satisfactory and structurally, very sound. In recent years, there have been many various modifications of this design centered on the use of wood laminated beams. With its

excellent fire resistant characteristics, wood lamination is a top rated material readily lending itself to various roof lines.

Type of Building

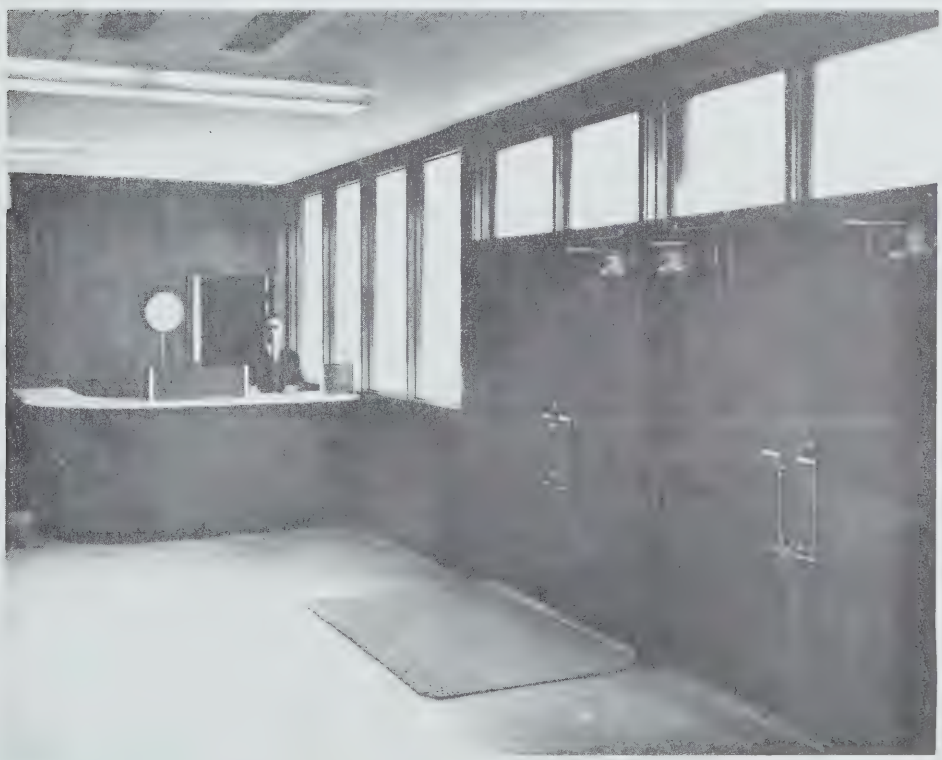
An arena is normally rectangular shaped, having a rounded, flat or hip roof or a modification, or coupling of these three basic types. The cross beams are of wood, laminated wood arches, or of steel. The walls can be concrete block with vertical concrete pillars as the major roof bearing structure, or the walls can be wood, sheet metal, brick, or a combination of these or other materials, depending upon local building and fire codes, type of building, capital funds available and intended uses for the building. Even glass has formed a major emphasis as a dominant feature of portions of some arenas, but its use on a large scale is discouraged if costly maintenance in cleaning and replacement are to be avoided. Many arenas use different materials in the entrance way area, in place of concrete blocks. Often brick is used to upgrade the appearance and to relieve the monotony of the concrete block.

Main Entrance

There is a difference in opinion as to whether the main entrance is best located at the front or the side of the arena. In the smaller, low capacity arenas, the main entrance normally is placed at one end of the building mainly as a lower cost factor. Often the entrance way and the dressing rooms are included in an ancillary one-storied structure that ties into the main arena at one end of the main arena. In the medium sized arenas, that may seat up to three or four thousand, the entrance is often placed on one side of the main building, with the dressing rooms placed in a one or two-storied addition to the main building. There are no general rules that are applied, and a front or end-of-building entrance may lead directly into the main arena with the dressing rooms placed along one or both sides. The critical factor is the width of the arena and the span required for the roof structure. The greater this roof span, the greater the cost of the total structure.

As arena capacity approaches the three to five thousand mark, the dressing rooms are most often located beneath the side seats, allowing for many more rooms than in a smaller capacity arena. If the seats are placed on one side of the arena only, sufficient space is provided to allow four dressing rooms, a concession area, refrigeration room, etc., beneath this area. While crowded, this is a very economical use of space where funds are limited.

Entrances



Ideally, the main entrance is on grade, allowing unobstructed and free access from the exterior. If steps are necessary, they are better situated within the building, eliminating icy exterior steps and possible injury, as well as permitting well lighted conditions for crowd dispersal.

Auditorium

In many front-entrance arenas, the area above the front foyer has been used for a medium size auditorium and/or meeting and activity rooms for various clubs and groups. This has proven to be an economical addition to the building.

Roofing Materials

Roofing materials are predominately of asphaltic or tar treatment, metal or asphaltic shingles while the roof may or may not be insulated. Ideally, roof should be insulated and have vapour barrier.

Exterior Wall Design

Precaution should be exercised if concrete blocks are laid in an inset pattern so that the protrusions are not sufficient to allow a wall to be climbed. A $\frac{1}{4}$" inset will provide the desired wall patterns and prevent climbing up the wall.

Icing Conditions

Eave troughing is important in southern Ontario in helping to eliminate the problem of water running to outside doorways and freezing, thereby causing damage. Some arenas have installed an electrical heating cable in the bottom of the eave trough, the down pipe as well, to prevent the build up of ice in the troughs. This has proven to be an excellent melting device.

Heated Storage

Provision should be made at one end, or side of the arena, for heated storage of mechanical ice-clearing equipment. This also requires a hot water outlet in this storage area. This space should have a minimum of 100 sq. ft. and be protected from public areas. Such equipment must have ready access to the ice surface.

Public Entrance

There are several factors that should be incorporated into the main entrance that are meaningful in crowd control as well as in staff efficiency.

Depending upon the intended capacity and type of activities, an entrance foyer should be of adequate dimensions to contain a minimum of approximately 1% to 4% of the gross crowd at any one time. This is especially important during inclement weather when patrons appreciate waiting in line indoors rather than outdoors. The larger the foyer that can be constructed, the better it will be appreciated by the patrons. Even in the case of a low seating-capacity, participation-only type arena, a reasonable size foyer is of advantage and can be utilized much better as a control point, than if little or no inside entrance space is provided. A great majority of existing arenas would dearly appreciate and utilize a larger foyer.

Two completely separated entrance and ticket areas are generally not desirable except where large crowds habitually patronize the arena. Such entrances create problems when only one entrance is used, when youthful exuberance finds an isolated corner for petty vandalism and other activities. Also two entrances require separate ticket booths and extra staff. Boys often use such a "dead area" for puck shooting practice or a rough-house area.

Ticket Sales

The ideal entrance and foyer provides a direct and obvious path to one or more ticket sales windows in such a manner as to allow free access to the main arena after purchase, without having to cross through another line-up of persons. This is accomplished by either having two ticket windows, on opposite sides of the foyer, permitting unrestricted line-ups to and from both, or by having a divider such as a railing separating the two ticket windows that are side by side. Many larger arenas have two separate ticket outlets and several have provided a ticket outlet for use on game or event nights, in the central part of the foyer, permitting access from two sides, along with the regular window on one or both sides of the foyer room.

In many smaller arenas the ticket office is entirely separate from the manager's office and often doubles as storage space for sundry supplies. Ideally, the ticket and sales office connects or is part of the manager's office, providing considerable efficiency for the office personnel, for the manager, who can handle advance ticket sales or provide information easily from a centralized location.

Portable ticket booths can also be provided for special occasions.

A small foyer is often conducive to a very cold and drafty entrance area since the exterior doorways are of necessity held open to admit even a short line-up of patrons. This creates an unpleasant area for both the patron and the ticket takers. The foyer should be heated in any type or size of arena.

Public Washrooms

Any arena, regardless of size, should provide washrooms for public use. These are normally located near or off the foyer in the smaller capacity arenas. The medium and large arenas often provide washrooms on each side of the arena. The number of units for both the men's and women's rooms will depend upon the frequency of large crowds. Most smaller size arenas of low spectator frequency appear to require a minimum of two urinals, two toilets and one wash basin for men, and two toilets and one wash basin for the ladies. A medium size arena (1000-2500 seats) requires a minimum of four urinals, three toilets and two wash basins for the men, while the ladies require four toilets and two wash basins. A large arena of over 2500 seats may require from five to eleven urinals and four to eight toilets, and four to seven wash basins for men, while the ladies washroom requires five to ten toilets and four to seven wash basins. In many medium and in most large arenas, ante-room is provided for the ladies washroom with a very large mirror and shelf on one wall. Upright urinals are best in the men's room since the trough or horizontal floor type has not proven satisfactory or hygenic.

Accessories

Many newer arenas have installed factory type foot operated semi-circular wash basins that accommodate up to six or more people at one time. This type of basin stands up well to heavy usage, and reduces considerably the amount of space required for the standard-type wash basins. Some arenas use the push-button type hot air hand dryer, but it is quite slow and causes line-ups when large crowds are present. Paper towels are still the predominant hand drying device in most arenas, large or small. Paper towels can be a major cause of blocked toilets, if the washrooms are not properly supervised and their usage controlled.

Washroom Vandalism

Most arenas, like all public facilities, suffer to a degree from vandalism of some form or other. The best preventative is still considered to be well-designed, high quality fixtures, and washrooms that are kept as clean and sanitary as is at all possible. Tile on the walls creates a most attractive atmosphere.

White paint has been used to advantage but walls must be touched up immediately if defaced. Red paint has been used on the walls of the toilet stalls and in one instance, an operator splattered sharp fine sand over wet red paint on the walls to prevent lipstick or pencil marks showing up, and to prevent wood carving. It seems to work, but does not present the most desirable appearance. Evidence indicates that teenage girls and lipstick are the worst washroom problems.

This paint should be a sprayed on epoxy paint which can be applied to brick or blocks and offers a high glaze and high resistance.

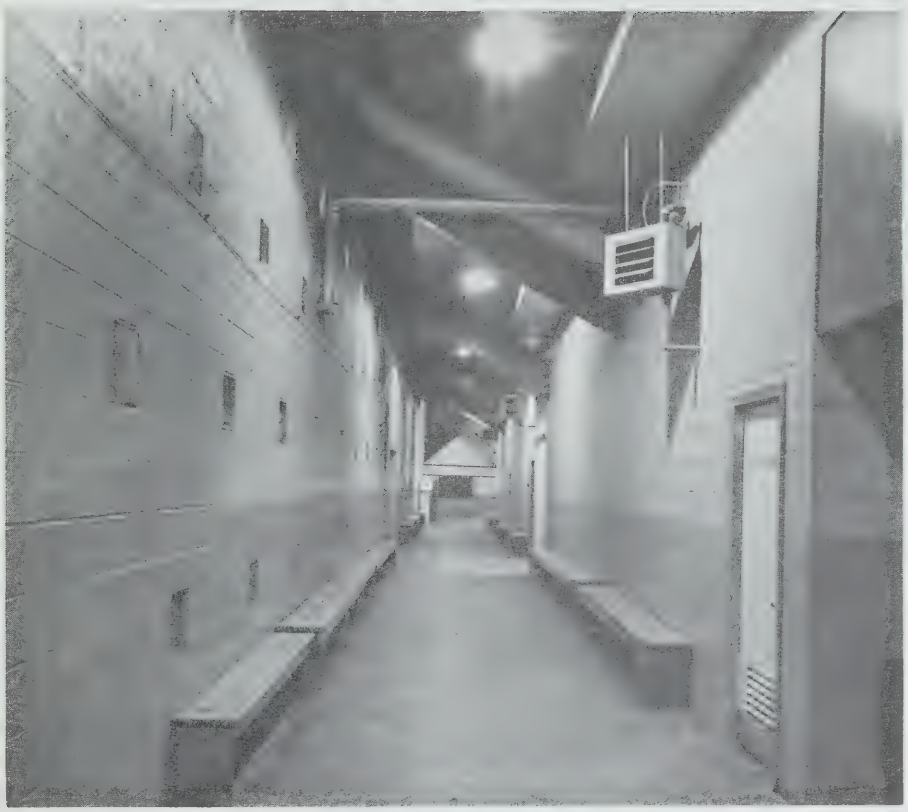
Toilet bowl water closets should not be exposed as they are subject to damage if not placed behind the washroom wall in a maintenance area not open to the public. Heavy duty facilities are well advised in any arena. Outside doors to washrooms for summer use can present a real problem if not closely supervised. Some arenas hire a person to be stationed in each washroom during events and activities to reduce the acts of vandalism.

● Concessions

Food and drink outlets are usually referred to as concessions, whether self-operated or leased to a private operator. Such an outlet is a normal part of every arena operation, large or small. The only difference between the various arenas is in the scale of operation, in that a large arena has several outlets, as opposed to one in a small arena. The concession is often located in the main lobby of a small size arena in proximity to the public washrooms. This area is heated for the comfort of patrons between periods. In a medium-size arena, there are usually two concession outlets, one on each side of the arena. A large arena may have 8 to 10 outlets, often located in the four corners of the building as well as along each side of the corridors.

Vending machines are used to alleviate crowded concession counters as well as to eliminate the need for staff personnel during off peak or low attendance hours. Some arenas have special booths set up for a single purpose, such as pop-corn or cigarette sales. These outlets are strategically situated to best serve the arena patrons.

A well laid out concession area can greatly increase food and drink net profits, as the time period for service to a large patronage is always at a minimum. The concession should be designed in such a manner that the soft drink and food section are convenient to each attendant, eliminating cross traffic and increasing efficiency. Excellent advice on this lay-out is available from several large scale confection entrepreneurs who lease and service outlets in many Ontario arenas.



Corridor
Used as
Dressing-
room for
Public Skating

Concession

Further discussion on concession operation will be found beginning on page 54.

● Public Telephones

Public telephones are usually required in any arena, and are best located in a prominent setting, either near an exit or in the foyer of the arena. A certain degree of vandalism occurs with public telephones unless there are good supervisory practices. By eliminating the booth and leaving the telephone exposed near the front entrance and in full view of the manager's office or ticket office, damage has been greatly reduced. In only unusual situations are more than two or three public telephones required.

● Check Rooms

Check rooms are not usually included in smaller arenas, as most public skaters simply leave their shoes in a dressing room or concourse area. Exceptions to this often occur with summer roller skating and shoes are deposited with the roller skate rental operator. Coin operated lockers have been installed in some arenas for checking of paraphernalia while skating. Should a check room be in demand, a dressing room can be converted to this use by using a "Dutch" door for this purpose. Check rooms are included as necessary in arenas promoting special events, dances, etc., on a year round basis.

● Supervisory Controls

The supervision and control of both staff, patrons or participants is exceedingly important for a successful operation. Therefore, it follows that the locations of the manager's office, the ticket office, first-aid room, and the refrigeration and electrical control rooms are critical in the execution of proper arena management.

The manager's office should be located to provide ready access to the main arena and should ideally look out on the ice area. This is a much greater necessity in a small arena operation, where the manager is more personally involved in the daily events and crowd control than in a multi-staffed operation. A smaller arena having the entrance and foyer area at one end of the arena itself quite handy to the manager's office being located in such a manner as to provide this situation. Many medium size arenas readily lend themselves to an excellent view of the arena interior, especially with a side entrance, and the concessions, washrooms and offices being located above the lower or first floor dressing rooms. The worst possible location for the manager's office is one in which this

space is located well away from the main entrance, being not only difficult for public access, but extremely awkward for the manager to keep an eye on the day to day operational and maintenance routines of the arena.

● Bulletin Boards

An easily identified and well-placed bulletin board in the main foyer is helpful in indicating daily, weekly, and coming special events. Such a board is of good advertising value, and assists the arena staff in answering many inquiries. The board should be posted with colourful, carefully lettered notices. Careless, misspelt, or out-of-date notices rob the bulletin board of its promotional value.

● Circulation

The recognition of interior circulation of both the public and of the maintenance staff, is of prime importance in the design of an arena. The main entrance should very obviously point or lead to the seating areas. This is not difficult to achieve in a small arena, but can be confusing in a medium or large scale building. The medium size, side-entrance arena lends itself to a very satisfactory solution to this problem when the stairs lead from the ticket windows in the foyer, directly to the second floor to allow a top entry to the main upper concourse and hence to the seats. In large arena buildings, well marked signs indicating the various sections coupled with large arrows are extremely helpful. Some arenas use various colours on these arrows to assist the patron, the arrow and ticket and seat colour being identical.

Full circulation within the interior of the building is a definite asset. This may occur at the top or bottom of the seating. Smaller arenas tend to have a concourse running behind the top row seats on both sides. It is important to have a substantial railing well above the height of the back row seats to prevent the standing spectators bothering the seated individuals. A very satisfactory design feature allows a full concourse around the entire lower level between the rink boards and the first row of seats. This is very helpful in the cleaning of the seat area, and also assists greatly in crowd departure and ease of exit. Some arenas, not having this lower concourse, present real cleaning problems in that the debris must be carried back up to a higher concourse or carried across the ice for disposal at an ice exit.

● Exits

Fire regulations demand that all exit doors be clearly marked by a red exit light

that is always lighted. These doors are provided with a crash bar allowing the door to be opened outwards in an emergency. Exit doors should be unusually wide, allowing up to 4 people to exit simultaneously. These exit doors are of great assistance in facilitating crowd dispersal especially if well located in relationship to the outside parking areas.

● Operational Services

The previous comments on circulation apply as well to the operational services such as custodial, janitorial, maintenance and policing.

Circulation and easy access to all parts of the arena is of great assistance and allows a much more efficient operation and hence service to the public. All areas should be well lighted at all times. Dead end corridors and hidden corridor areas are to be avoided in any design, as they create problems for the supervisory staff especially during low attendance events or for public skating being an unorganized event.

Janitorial ease of upkeep and convenience depends to a large degree upon two factors, being -

(i) traffic flow and circulation, and
(ii) type and quality of building materials.

A good building design considers janitorial problems and provides sufficient space in concourse and corridors to allow an efficient and logical cleaning pattern. Of equal importance are the type and quality of materials used for walls and floors. A later section will deal with the general choices available.

The extent of policing, supervision and service will depend upon the number and type of activities and events. It is customary that the local constabulary in the smaller municipalities either assists directly or is paid for special service at the arena. Medium and larger arenas usually hire off-duty policemen or take advantage of private protection personnel on an hourly or contract basis. Some special activities may involve a greater proportion of policing than for normal events.

Some type of policing protection may be required on a 24-hour basis. A burglar alarm may be installed in the concession outlets and in the ticket and manager's offices. Watch dogs have been used very successfully, by allowing the dog to have full freedom to roam the entire building during closed hours. Before such a measure is undertaken, legal advice should be secured to ascertain the legal

responsibilities of the arena authority should an intruder be seriously attacked by the dog.

Storage

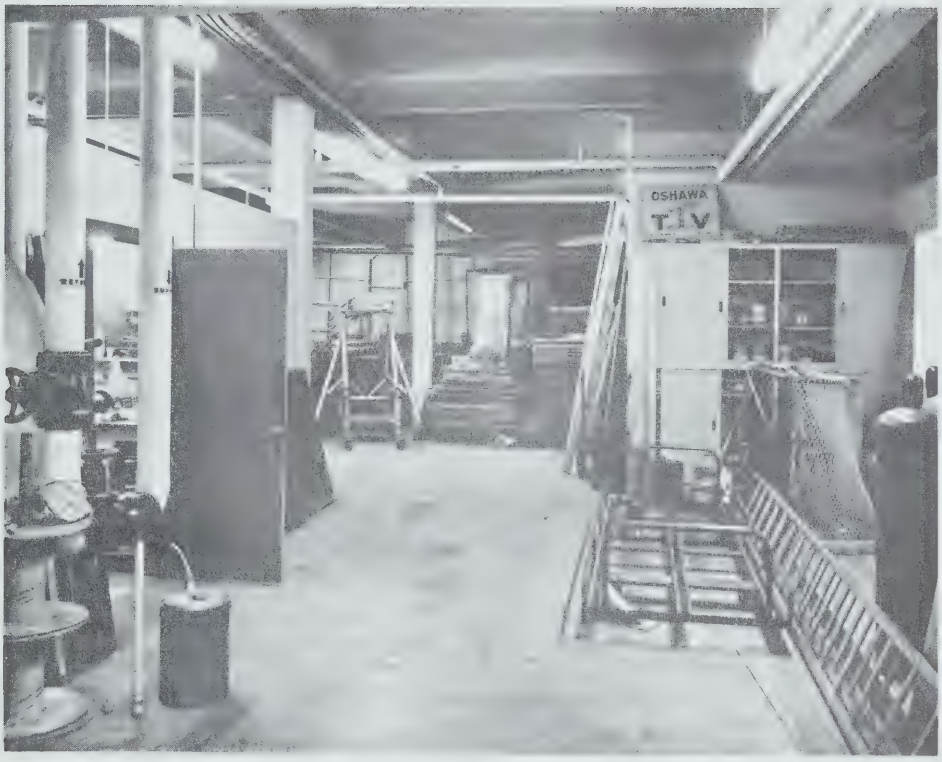
The one dominant comment of virtually every arena operator in regard to storage is the same, "there can never be enough". Strangely enough this feature is often completely overlooked or neglected in arena design. While many smaller arenas have no real need for large items such as stage equipment and scenery, chairs, tables and various equipment, as do larger operations, there is always a demand at an arena for storage of hockey equipment, summer playground equipment and similar apparatus. This is especially true if the arena manager is also the local recreation director. There is also a tendency to use the arena maintenance and repair room as the workshop for all municipal recreation equipment (power equipment, etc.,) and facility repairs. This is usually quite unsatisfactory due to space limitations, unless consideration for this has been taken into account in the original design.

The small arena may be limited in storage due to the seating areas being of insufficient depth or height to provide space beneath. Usually, an addition is added to one end of the building where one half of this area becomes the refrigeration and electrical rooms, while the other half of the area can be set aside for a workshop and storage space. This type of accommodation can be also added next to the front dressing room area or placed at the side of the arena. This might provide a more convenient location for control purposes and save many steps in daily operation.

The area beneath the seats is often used for storage in medium-sized arenas along with special storage rooms. Large arenas utilize the space beneath the seating for various rooms and functions, often neglecting storage. This may require a special section or room built at the side or end of the building for this purpose. If at all possible, special storage rooms should have wide doorways and convenient access to the main arena floor.

Press Box

The press box is located at the centre ice section of the arena, and built into the rafters or superstructure to allow as high and convenient an observation position as possible. The box should be divided into at least three sections or more, allowing for semi-private use by various personnel of the press and radio media.



Storage
Problems

Dressing Rooms

Most arenas have a minimum of four dressing rooms. While some of the rural municipalities have only two, this has proven completely inadequate to satisfy the needs of an active program. Most arena operators would prefer to have a minimum of six rooms and larger arenas have eight to ten. One major factor in the need for extra space is the fact that one room is normally occupied at all times by the senior local team. Most municipalities now cater to an extremely active boys minor hockey league that applies heavy demand on dressing room facilities.

Ideally these dressing rooms should be approximately 24' x 12' or 288 sq. ft. for normal use, although some rooms are smaller and average about 21' x 12'. Senior teams usually are provided with one room that may be 350 to 400 sq. ft. Each dressing room should have floor drains to facilitate cleaning. A 1" water outlet should be conveniently located in the corridor near the dressing rooms to allow use of a hose for cleaning purposes. While some arenas have dressing rooms as small as 12' x 9' there is scarcely room for a minor team to dress, let alone a more senior group. Considering coaches and other team personnel, a dressing room can quite easily attract 24 people or more for certain events.

Showers

Most arenas have at least one shower per room, although some smaller arenas have none. It is a common practice to design one shower area common to two dressing rooms, with a doorway leading into the shower from each room and thus provide privacy between periods. Most showers have at least two heads. Some showers have a 30 second or longer control tap to save water, while controlled water temperature of about 110° is an assistance in providing sufficient warm water for everyone. Moisture and condensation create upkeep problems on the walls and ceilings. Various materials are used to overcome this problem, such as ceramic and plastic tiling of the entire room or portions of it, painted concrete walls, or the use of sprayed on epoxy paint. No piping should be exposed excepting the head and tap. Adequate ventilation by use of an exhaust fan to the exterior assists greatly in removing air moisture. By separating or dividing the shower room from the dressing room a much appreciated drying area can be provided. The complete shower room and drying area should have a minimum of 140 sq. ft.

One toilet and wash basin separate from the shower room are sufficient for each dressing room. These may double for use by patrons during special events, skating or for summer use if no public washrooms are provided for these purposes.

Benches

All benches should be supported by angle iron from the walls and be made of wood. Nuts and bolts are the best means of securing the benches. These aid in ease of replacement of the seats as required. This type of bench facilitates cleaning of the floor.

Clothing Hooks

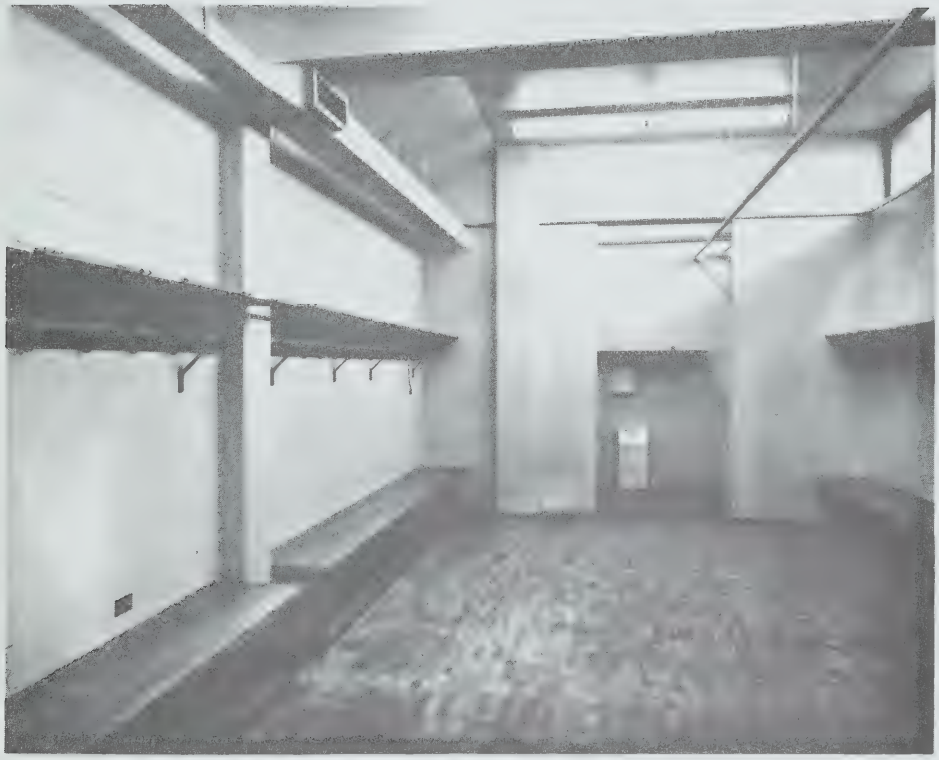
Lockers are only provided in very large arenas or for professional teams. The type of clothing hooks is always a source of concern as they are very often pulled off the walls. The clothes hooks should be made of steel strapping or rods and secured to the wall directly or to a steel plate, which in turn is permanently bolted to the wall. Any other type of hook is only temporary and normal screwed-on types or nails are quite unsatisfactory. A wooden shelf that is attached by angle iron to the wall, is very useful when placed above clothing hooks.

Floor

The floor materials for use in a dressing room to withstand skate wear can be bare concrete, rubber belting strips over the concrete floor, hardwood or tile. Light coloured good quality asphaltic tile has proven to be a most economical floor surface and able to withstand much abuse. Bare concrete is an entirely unsuitable surface, being subject to damage as well as being extremely damaging to skates. Unpainted concrete becomes dirty and unsightly and is a constant dust factor. Rubber belting or a similar material receives wide use. Hardwood is a costly floor although it has an excellent appearance when new.

Doors and Locks

Adequate doors to withstand rough usage are always of concern. In the long run, steel door jambs and medium gauge sheeted doors are the most useful and practical and pay for themselves both in repairs and appearance many times over. With a high volume of traffic in and out of dressing rooms, the problem of theft is also present. One operator has resolved this problem by installing hasps on all dressing room doors and leaving the onus of providing a lock and padlocking the rooms to the players and their coach. Most arenas leave all keys in the hands of the rink attendants to prevent loss of keys and possible duplicating. The attendants then open and lock all doors.



Typical
Dressing-room

Shower Room

Ceilings

Plywood and other durable materials are much superior to acoustic tile, as the ceiling invariably suffers from hockey stick damage. The repair of ceiling tile is troublesome and, as well, when damaged, it presents a run-down appearance. All ceiling lights should be flush with the ceiling and covered with durable glass or fibreglass. There should be no exposed pipes, unless the ceiling is of an unusual height.

Windows

Many newer arena designs are eliminating all windows in the entire arena. When one considers that the predominant activity takes place during evening hours, there is little justification for any windows. This eliminates many repairs and reduces the opportunity for vandalism both from inside as well as outside the building. A fibreglass or plexiglass skylight has been used in the dressing room areas where these rooms are part of a one-story structure if daylight is considered essential. Should ventilation be desired an exhaust fan can be easily installed. In some cases, glass windows have been replaced by fibreglass, greatly reducing breakage while still allowing light penetration.

Equipment Drying Rooms

Most arena design overlooks a well-ventilated, warm drying room for hockey equipment. This can be located in an otherwise unusable space such as beneath the seating even if there is low headroom to the ceiling. There is a real need for such a convenience in the interests of good sanitary practice as well as providing a safe storage space for team equipment. Some arenas have built simple wire-mesh portioned spaces so that several teams may use one large area.

Referees' Room

The referees and line-men should have a small dressing room, preferably with a single shower, a wash basin and toilet. Several chairs or a bench with wall hooks and a mirror complete the requirements of the officials. All too often these men are delegated to the boiler room for their changing needs. This room should have a minimum of 100 sq. ft.

First-Aid Room

A first-aid room is usually provided as a single purpose room. A table, or bed,

a chair, a first-aid kit, a wash basin and a stretcher are the basic requirements. Some smaller arenas double up on this space by utilizing a portion of the ticket office or other room space.

An arena having an active hockey and general skating program must consider the first-aid room as a basic requirement of the operation. The first-aid room is often placed near the front door or a major exit to allow quick and easy access for emergency purposes. This room should be a minimum 90 sq. ft. The first-aid room if over-sized can be used for small meeting purposes as well in non-hockey hours.

Ice Surface

Generally speaking, most arenas' ice surface averages 85' x 185' or approximately that dimension. The width may vary from 75' to 90', and the length 175' to 200'. Only occasionally does the dimension reach over 190' in length. One advantage of an unusually large surface is the opportunity to divide the ice into 3 cross sections to allow much greater use of the ice and greatly increase participation by the younger beginners, and also for summer events such as exhibits or various special events.

The floor may be sand, polished concrete, terrazzo or trap-rock, the latter two materials are usually used. Asphalt is not a satisfactory surface. (See refrigeration for further details)

Rink Boards

The boards in any arena are subject to an unusual amount of heavy use and abuse. The most satisfactory type is supported by 2" x 4" or 4" x 4" upright wooden studs 3' 6" high, attached to a concrete piling or sill by angle iron supports, rather than being set directly in concrete. These posts are subject to rotting and if bolted in position can be readily changed. The rink boards are fence-like in construction having two horizontal 2" x 4"'s at 4' or 6' centres and capped with 1" x 6" plywood, hardwood, or a 2" x 6" planking as a top runner. The vertical rink boards are of 1" x 6" first grade spruce or, more commonly, 3/4" plywood sheets. Tongue and groove pine has also been used. Some arenas have tried vertical 1" x 4" boards covered with 1/4" or 1/2" plywood. Good results have been achieved with 3/4" birch plywood as rink boards, resulting in very low upkeep costs to offset the high initial outlay of almost three times the cost of normal plywood. There have been reports that the use of spruce and birch is questioned, due to the tendency to warp under certain conditions.

Puck-board

The puck-board, sometimes referred to as the kick-board, is the horizontal board or material at the bottom of the rink boards, lying next to the ice surface and hence subject to considerable wear and tear. Various materials have been used, some with reasonable success, some with poor results.

These include 1/2" and 3/4" plywood, 2" dressed pine, 1" birch, 1 1/4" clear solid oak, elm, masonite, rubber belting and even steel plating. The plywoods are turned over after each season and thus last about 2 years. Elm is subject to twisting or warping, despite its durability. Birch lasts well and oak is highly favoured. Masonite does reasonably well and is easily replaced, as is rubber belting. At least one city in the American Hockey League has used steel plating for the last two seasons, and one or two Canadian cities have tried this. While plywood is in very common usage, oak is receiving greater recognition as being a superior material as a puck-board.

The players' benches should be completely separate from the penalty box, and the penalty box is often placed at one side of the arena, the players' benches on the other. If possible, the two teams should have provision to reach their dressing rooms by separate gates to prevent any altercations. The players' boxes should have a high back to reduce interference from the spectators. The floor of the various boxes should have a skate protective cover such as rubber belting, as should the corridors from the dressing rooms to the ice surface. The players' boxes should have capacity for at least twelve players. All gates should open inwards, not onto the ice.

Rink End-boards

The end sections of the arena must be screened or protected as a safety precaution and this protection should extend around and beyond the corners by at least 6 feet. Medium gauge chain link fence is commonly used, supported by a steel or 2" x 4" wooden frame, running five feet above the rink boards. Shatterproof glass is used in many larger arenas, and a lower (2 foot in height) section is sometimes carried down the full length of each side of the boards. Breakage of this glass is greatly reduced by using 5/8" in place of 1/2" material. Welded screening used as protection, tends to break from hard shots. Chain link fencing tends to stretch or loosen, but this can be adjusted or tightened periodically.

Goal Judge Cage

An enclosed wire-mesh cage of approximately 15 - 18 sq. ft. serves well for the

goal judge. The red electric bulb is suspended within the cage to provide optimum viewing by the spectators. A blue bulb, denoting the end of each period or the game is also placed adjacent to the red bulb, but is controlled from the penalty and time-keeper's bench.

Floor Drains

The main arena floor must have a drainage system to allow the water to drain away when the ice is to be removed. Four or more drains connected to a sewer system should be provided at strategic points along the edge of the cushion. Water drainage can be a problem if not provided for.

LIGHTING AND ELECTRICAL NEEDS

The usual lighting systems are incandescent, mercury vapour or fluorescent. There have been major improvements in all three systems in recent years, and preference for any particular type would appear to be a matter of personal operator preference. The major criteria or standard for lighting is measured in foot-candles, being a measurement of light intensity at a given point. An indoor arena should have a reading of 20 to 30 foot-candles four feet above the ice surface. Painting the ice white during the initial ice surface preparation aids greatly in light reflection, often reducing the need for extra lights. The question should be "how well can one see" rather than "how much lighting is there". The essential lighting design consideration should be that of providing an equal or similar amount of light upon the total ice surface. This problem can be easily solved by an electrical engineer, who would provide this service through the arena architect. All electrical installations are normally subject to both municipal by-laws and regulations as well as the national building code and national building code fire regulations. These regulations state that all electrical main service panels with main service switches, meters and main light and power panels should be located in a self-contained room having a 3-hour fire rating (10" concrete walls and metal doors).

Secondary lighting control panels may be located in the main office, ticket booth or press box, or a combination of these locations. The main point is that these secondary controls should be readily accessible, provide a clear view of the ice surface, but be protected from public access.

Fire regulations call for exit lights to be electrically illuminated at all times and clearly indicating the path of exit to the exterior.

Lighting
Systems

Battery-powered emergency lighting should be provided for all exit areas, as well as critical interior seating areas. While some smaller arenas rely on tractor headlights in case of emergency, this is hardly the solution to what could be a critical and dangerous situation involving human safety.

There are definite operating advantages in housing the primary electrical switch controls in a position overlooking the ice. In a small arena, the ticket office, concession, or manager's office may house these controls. A large arena usually has these units contained in the press box or a central office or room overlooking the main floor area. Too many times, these controls have been located at the end furthest from the foyer and manager's office.

Heavy duty electrical outlets should be placed on each side of the arena floor and adjacent or attached to the inside of the rink boards, for use during special events or exhibitions. The corridors and various rooms should also contain electrical outlets for various plug-in convenience. All thermostats, switches and similar electrical devices should all be protected from inquisitive hands.

Snow Removal

A pit to receive the ice and snow removed from the ice surface by the cleaning equipment should be located in close proximity to the ice surface. The best location is in the corridor of the service entry gate. The pit should be of a large size, have a protective grating to screen debris, and have a hot water inlet to quickly melt the snow. The pit should always be covered by a trap door when not in use.

Painting and Colour Schemes

The rink boards require greater upkeep and painting than other portions of the arena building. The rink boards are traditionally painted white, the puck-board and top runner red, or sometimes orange, there being no specific rules on this matter. The white boards provide an excellent background and contrast for easy player identification by team members and when well maintained provide a clean neat appearance. This painting occurs before and after each hockey season. If the surface is used for summer events, such as roller skating, some operators paint the boards a light green for a cool summer appearance, then re-paint the white surface for the winter months. A periodic washing through the season is helpful.

Heating

The decision as to heating an arena, or portions of it, depends to a large degree on the nature and type of activities, whether the arena caters to a paying patronage, as well as the counter attractions in the community. Many smaller, rural type arenas only provide heating for the various dressing rooms, ticket booth and concession. Others provide heat to the lobby or gathering area just within the main entrance, which is often located at one end of a smaller arena with shatterproof glass between the ice and this portion of the building. The arena design may incorporate a large open auditorium type room above this front foyer area, which is also heated. Some operators state that the type and quality of the program still remains the key factor in attracting patrons. However, considering the number of counter attractions, television, and increased competition for the leisure-time dollar, even a small arena should install a heating system in at least one large area for between periods warm-ups. The heating plant in such lobby areas is normally a forced hot air, hot water or steam system.

At the other extreme are the large spectator-oriented buildings in which a very elaborate heating system is installed. These systems are forced hot air or a hot water and blower system. Large arenas are kept at 65- 68 degrees for events, the temperature being affected by the release of surplus B.T.U.'s from a large crowd. Naturually, the refrigeration system is designed and installed with the temperature factor in mind in such arenas.

Between the extremes, and usually evidenced in medium size arenas, and more frequently in the last few years in even smaller structures, is heating supplied by electric or gas infra-red heaters. These units are suspended over the seats below the rafters. These units are sometimes installed to cover the entire seat area, or only portions of it. A single unit may cost up to $225.00 installed. The units are normally placed at 10' - 12' centres and the area covered is in direct proportion to the height of the lamp. A full complement of units (50+) has a low operational charge, depending on local utility rates, of between $1.15 and $2.25 per hour.

An infra-red heating unit installed over the mechanical ice cleaning equipment is very worthwhile, especially on very cold nights to facilitate easy starting of the engine.

Heating for the offices and dressing rooms in a small arena may be from a furnace provided for that purpose while another unit supplies the needs of refrigeration and electrical rooms that may be at the other end of the arena.

Hot and cold air ducts should not be installed in the floor of any room, especially

dressing rooms, where water is used liberally for cleaning.

Ventilation

Adequate ventilation of the main arena is essential and critical. If not adequately provided for, fogging and condensation occur within the building, especially during a crowded event. Some arenas are designed with vents evenly spaced along the centre roof area. Exhaust fans may also be located in each end of the arena or in the roof. The architect or refrigeration firm should compute the size of exhaust fans required for volume of air movement, as this will vary depending upon size of arena, heating, number of spectators, insulation and seasonal use. Exhaust fans are extremely useful in summer events, especially if the building is used for exhibition and fair purposes in the warm season.

Hot Water Boilers

Hot water is required for showers, flooding and in some cases the heating system. Depending upon the building design, a single boiler may be used for the showers and flooding purposes, or there may be separate boilers. A 300 to 400 gallon tank will provide sufficient water for showering purposes if a water pre-mixer is used. Gas heat provides much faster heating of water than oil.

Refrigeration

The selection of the most proper and efficient refrigeration system for an arena building is a complex matter for persons not familiar with the technical variables that constitute the basic criteria for the selection of such a system. The principal variables that determine the refrigeration system are discussed.

Variables Affecting Type of Refrigeration Unit

1. Proposed Activities — The basic factor in the refrigeration system, as well as the overall arena design is the proposed use in terms of activities and programs. Questions to be finalized are: Is the arena to be used for non-ice activities in the winter? Qr, will there be need of ice during late or early season? Or, in the summer months?

2. Ice Surface Dimensions — The width and length of the ice cushion is a basic factor in the determination of the amount and type of piping, as well as the floor area to be flooded, as this total floor area is one determinant of the

equipment requirements.

3. Length of Season — The refrigerant equipment requirements will vary in relation to the length of season for which an ice surface is required. The longer the season that begins or extends between the average winter requirements (Oct. 1 to Mar. 15), then the greater the need for heavier duty type equipment. This is especially true for arenas operating throughout the summer months catering to ice hockey or figure skating schools.

4. Type of Building — The type of building will greatly influence refrigeration needs, as a non-insulated building will be subject to greater heat transfer qualities and characteristics, as evidence by a non-insulated steel type roofing material vs a wood decked roof, or black vs white shingles. The wooden materials and white exterior help greatly in the reduction of heat absorption. Special attention should be given to adequate vapour barriers.

5. Electrical Requirements — The source and type of power available is another factor in equipment selection. Equipment choice may depend on the availability of 3-phases or 5-phase power.

6. Coolant — There are several types of coolant used in the refrigeration process, the most common in ice arenas being ammonia or freon. The choice of the system may depend on the availability of low-cost water, or the type of activities contemplated for the arena. If it will be necessary to remove ice during the mid-winter season for certain special events, and then replace it within a short time lapse, the refrigeration system needs would be adapted to this requirement.

7. Floor Materials — It will be necessary to decide upon the type of floor materials to be used. This might vary from sand, to concrete, trap-rock or terrazzo. Asphalt is not recommended. The floor piping may be plastic or steel, depending on the floor surface materials.

The Ice-Making Process or Refrigeration

Refrigeration is the process of producing within an insulated enclosure, temperatures below that of the enclosure's surroundings. The process of refrigeration of an enclosure and its contents consists of extracting heat from the space in which the temperature is to be lowered, and rejecting it to the surroundings (or some other external medium) which are at a higher temperature. There are two major classifications of cooling systems, namely -

1. direct expansion
2. indirect expansion

Refrigeration
Units

1. Direct Expansion — The refrigerant itself (ammonia, freon, or other) circulates directly in pipe coils in the arena floor. This system tends to be lower in initial installation costs, but can be more expensive to operate due to a greater volume of refrigerant used in the ice-making process. The main advantage of the system is that it produces a low freezing temperature in a very short period of time. However, the ice is difficult to remove in a short time should this be necessary. Another disadvantage is the possibility of damage to the floor pipes resulting in an ammonia leakage which might lead to a dangerous explosion level.

Direct expansion eliminates entirely the use of brine.

2. Indirect Expansion (Brine System) — The refrigerant cools a brine solution (having a very low freezing point) in a heat exchanger and the cold brine circulates in pipe coils in the arena floor creating a freezing condition. When the water is applied to the floor surface by flooding, the ice surface is formed. This system tends to be higher in initial capital cost than the direct system, but can have a relatively low operating cost. The major advantages are: a reduced amount of refrigerant required, as well as less danger from leaking refrigerant in the system; the brine can be heated and circulated in the floor pipes so that the ice may be removed in a very short period (3-4 hours) for special events during the ice season, and then the ice can be replaced in a short space of time for subsequent ice events.

● Refrigerant Cooling

Water is used to cool the refrigerant in the refrigeration system by one of two systems -

(i) Shell-in-tube — This is the least expensive to install but uses a large volume of water. If water is being purchased to even moderate rates, this cost can be prohibitive for an operating season.

(ii) Evaporator-condenser — In this system, the ammonia is passed from the compressor to the evaporator-condenser, where water is sprayed over and around the tubes containing ammonia. The water is then recirculated and hence results in a very great saving in water. This annual saving will be substantial over a period of years.

Should water be obtainable at little or no charge, the shell-in-tube type of condenser may serve its purpose and avoid the higher costs of the other system.

Floor Materials

The refrigerant circulates in the floor through a series of coils or pipes. Polyethylene piping is considerably less expensive than steel pipe, but any advantage cost-wise is reduced by the necessity of installing reinforcement in the concrete slab to avoid cracking of the slab. Steel pipes are therefore commonly used as they act as the reinforcing media in the flooring. The pipes are usually 1" + in diameter, laid at 4" centres in a sand bed. If the final floor material is to be sand, it may lead to the use of plastic piping as a saving in funds, but this type of floor eliminates any possibility of non-ice usage for other activities during the summer season.

A concrete floor is poured as a continuous monolithic slab with no joints. The concrete is poured in non time-phase. The surface may be highly polished in its finishing, or trap-rock or terrazzo may be added over the rough concrete to produce the final surface. If roller skating, or summer activities are contemplated, the high quality terrazzo or trap-rock with its excellent surface features and ease of maintenance, is a well justified expenditure. The steel pipes are normally laid in sand and then the concrete slab poured over the entire area. It is highly advisable to utilize hard, sharp granite stone chips and sand aggregate rather than limestone chips or sand. The chemical properties of limestone tend to lead to flaking of the concrete surface, whereas granite does not cause this problem. No calcium should be used in the concrete mix as this chemical will erode the piping.

Sub-soil Drainage

Prior to the final design stage, soil borings should be taken to determine the subsurface soil features. This is necessary to determine loading requirements for the footings, as well as drainage feature of the floor area sub-soil. It may be necessary to carry out extra-ordinary footing and overall excavation to eliminate future drainage and loading problems. The excavated areas are back-filled with porous gravel to overcome this problem. This added cost at the outset may represent an extremely wise investment in preventing very frustrating and costly renovations at a future date.

Main Components of Refrigeration System

The three essential components of a refrigeration system are:

(i) a machinery room with compressor, storage tanks and controls,

(ii) pipe or connecting linkage from machinery to floor pipes in the "header" section at one end or side of the arena floor,
(iii) closely spaced floor pipes that cover the entire arena floor.

These components suitable for a rink of 85' x 185 ' could cost seventy to eighty thousand dollars, at current prices, excluding building concrete floor, boards, and so on.

Ice Surface Maintenance

The main point of judgement of the arena operation is often the quality of the actual ice surface. Prior to the application of any water, the floor surface should be thoroughly swept and cleaned, especially if there are any grease spots or similar markings. Should the flooring be sand, any weeds or similar plant growth should be removed.

The normal steps in surfacing techniques are: the chilling of the floor surface; flooding surface with light sprays to form a good base; painting of entire ice surface with a special white paint on 1/8" to 1/4" depth of ice surface, then flooding to 1/2"; red and blue lines added; complete flooding to 1" or 1 1/4" of ice at a maximum. When ice is kept at 1 1/4" to 2" thickness or over, expenditures mount as the refrigeration equipment must work constantly.

Ice paint may be applied with a brush, roller or spray machine. The ice thickness is checked by the use of a hand drill or simply checking the height of ice at the baseboards or entrances. Normally the ice thickness is checked several times a week, especially if there is considerable ice activity with many cleanings and floodings.

Flooding

The temperature of the water used for flooding is an important consideration in the final ice surface quality. The water should be between 150 to 180 degrees F. for best re-surfacing application results. Approximately 45 to 50 gallons of hot water are needed for normal flooding purposes.

Snow Clearing

The ice may be cleared by hand scrapers or by mechanical ice cleaning equipment.

The cost of labour in hand cleaning and flooding by a man-drawn cart can be greatly reduced by a mechanized re-surfacing machine that cleans, shaves the ice, picks up the snow, and floods the ice surface in one operation, by one operator. A re-surfacing machine can reduce the ice cleaning time by hand from thirty minutes to ten minutes. Such a machine may run from several thousand dollars upwards to fourteen thousand dollars, depending on the quality and needs of the arena operation. An Ontario manufacturer provides a re-surfacer that attaches to a tractor on a 3-point hitch. This is in common use in many small and medium arenas in Ontario while more expensive machinery is often used in larger capacity arenas to good advantage.

Snow Disposal

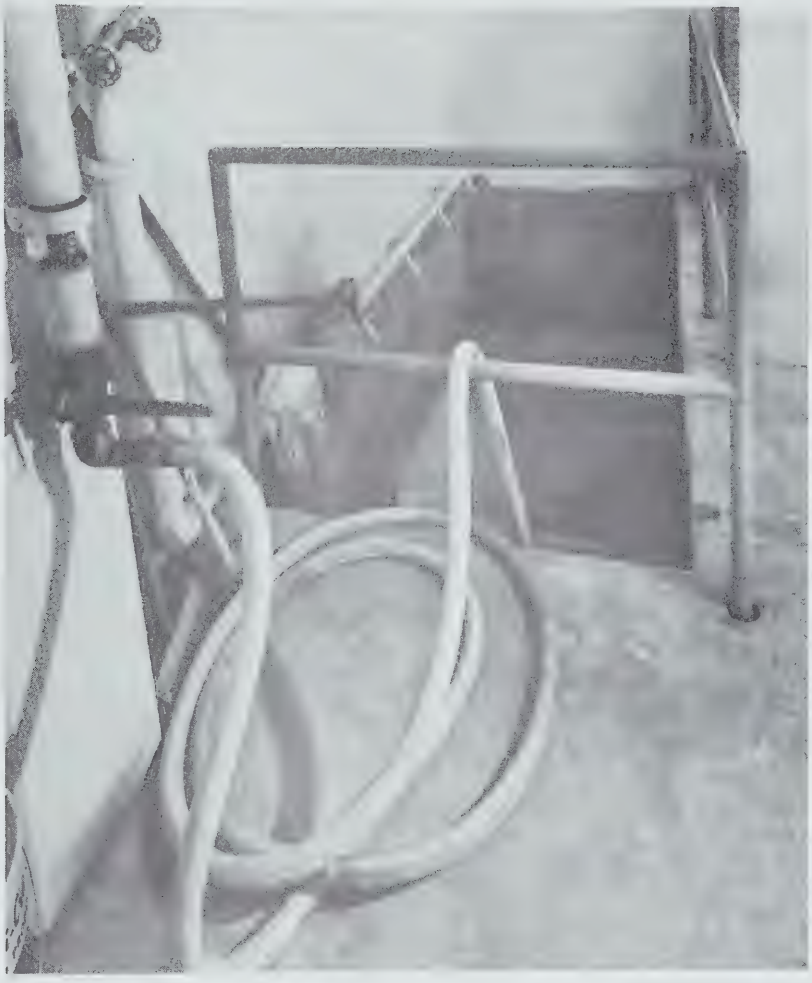
The need of a snow disposal area is very important. The residue snow from the ice surface can be hand shovelled into a snow pit at the side or access entrance to the ice surface, when hand shovels are employed. The same area provides a floor drainage area for a re-surfacing machine to dump its snow load or its melted contents. The snow pit is constructed in such a manner that hot water or steam is added to melt the ice and snow particles. The more expensive ice cleaning machines are built so that the snow is melted out of the machine between re-surfacings by hot water or steam, and the water runs into a nearby floor drain.

Planing

If a re-surfacing machine is not used and the ice is not constantly shaved, the ice build up of over 1 1/2" must be removed periodically by a hand operated power-planing machine, or a planing machine that is attached to a tractor by a 3-point hitch.

Ventilation

Any arena building must be designed so as to recognize the problems of condensation and "fogging". Proper air ventilation is a must and should be recognized by the arena architect. Normally large fans are placed at the ends of the arena, or in the roof structure, to draw off the excess humidity in sufficient volume to reduce the possibility of mist or fog to occur. The actual type and size of fans must be calculated by the architect or an engineer taking into account size of ice, heating of the arena, number of spectators, etc. The lower the roof to the ice surface, the greater the tendency of fog occurring.



Types
of
Ice
Pits

Ice Removal

It is important that the paint is removed from the ice in the melting process before the paint comes in contact with the floor material. Either scrapers or a squeegee may be used in order to avoid a rather messy clean up job.

Statutory Regulations

The operation of all refrigeration systems is governed by the Ontario Department of Labour through the Operating Engineers Act. This Act states that,

"Refrigeration plants above 50 horsepower (over 15 P.S.I.G.) but not over 400 horsepower require a refrigeration operator class B or a third class engineer as chief operator and a refrigeration operator class B or a fourth class engineer as shift operator".

"Refrigeration plants over 400 horsepower (over 15 P.S.I.G.) require a refrigeration operator class A or a second class engineer as chief operator and a refrigeration operator class B or a third class engineer as shift operator".

This regulation makes mandatory a 24-hour coverage of the refrigeration equipment by qualified (as per the Operating Engineer Act) personnel. The regulations do not require 24-hour coverage if for example an 80 H. P. unit is made up by one 50 H. P. compressor and a second compressor of 30 H. P. rating.

In this case, a class B operator is required to be in charge of such equipment, but it is not necessary to have 24-hour attendance.

Cost of Refrigeration Equipment

The cost of refrigerating equipment for an indoor rink of 85' x 185' may cost as much as seventy to eighty thousand dollars, not including the cost of the building superstructure, the concrete floor, insulation hockey boards, and footings, etc.

Program Rooms

Many arena buildings contain a number of rooms and facilities for non ice-oriented

uses. These additions fall into three general categories -

(i) Small arena auditoriums over dressing room area,
(ii) Medium arena auditoriums and meeting rooms,
(iii) Medium to large arenas with several meeting rooms and special facility areas such as stages, etc., in main arena area.

(i) Small arenas — Many Ontario arenas with a front entrance have taken advantage of the large area on top of the foyer and dressing rooms, as a large high ceiling area suitable for banquets, receptions, meetings, dances and various community recreational activities and programs. This area usually contains a stage with lighting, a small kitchen, public washrooms, and janitorial storage space. This area can be reached by two separate staircases leading from the lower floor. There is usually an area of at least 6,000 sq. ft. plus a stage of from 500 to 800 sq. ft. This space is invaluable in a small community and often receives considerable use. This area must, or course, be heated, and requires the installation of a heating unit of sufficient size to handle both the lower and upper floors of such a structure. This space has either hardwood or good quality linoleum tile floors as well as overhead and often indirect lighting for events such as dances. The kitchen usually contains a large kitchen type stove, large refrigerator and most important, a large serving counter and cupboard space next to a large sink and drying area. The kitchen is best designed so that a side wall opening with adequate serving space connects the two rooms. In addition, there should be adequate storage space for chairs and tables. Advantage can be taken of the space beneath the stage for this purpose.

Such an area above and facing the end ice area may double as a concession area and public viewing area for ice events.

(ii) Medium Size Arenas — In addition to an auditorium, as described above, many medium arenas also contain certain additional rooms which may be used for other community recreation programs or by various clubs and organizations. The size, scope and feasibility of incorporating such extra space depends to a large degree on the local needs and interests. There should be definite justification for such extras and strong public recreation leadership, in order to fully utilize such space. While some towns and cities have benefited greatly from such auditorium space, others use it on rare occasions, dubbing it "dead air" space. Much depends on the local arena or recreation board and director.

(iii) Medium to Large Arenas — Such arenas may incorporate special meeting rooms and banquet rooms in the main building or in an additional building space attached to the main arena. This floor area may be up to 3,800 sq. ft. and seat up to 100 persons for banquet purposes. It is usual to employ a catering

Small
Arena
Interiors

service for meals rather than to attempt to install expensive and space consuming kitchen equipment. This space is often treated in a commercial sense, being rented out with income as a primary goal rather than as a subsidized public service. There are a few large capacity arenas in Ontario that have included a substantial stage at one end of the arena floor, eliminating the end seats. Other large arenas have portable type stages that may be placed within one end section of the arena. The portable type is costly both to set up and remove, and also involves serious consideration of an adequate lighting system for stage shows, as well as a high quality PA system.

When the entire main floor of the arena itself is used for events such as banquets and special civic functions, meals are normally arranged through a catering service.

When such facilities as a stage on these proportions is considered, it is very important that various arenas having such facilities are visited, as well as professional performers interviewed for adequate design solutions to overcome future operating problems. When such a stage is included in a building, storage of stage property becomes a critical factor and serious attention should be given to the various materials and equipment requiring such storage. (See section on refrigeration for further comments on mid season ice removal, or use of main floor for special events) Some arenas are designed so that the rink boards are removable for adaptation of the area for other uses.

Curling

Curling, because of exacting ice surface requirements should be considered as a special facility and not as part of an ice arena program. On the other hand, curling can be played on a large surface with certain limitations. A curling rink requires the hacks to be frozen into the ice at 138' centres. This leaves considerable space at each end of an average ice surface. It is also difficult to divide the rink into lanes with wooden planks to separate each lane. There can be no comparision in ice surface quality to a good curling rink and a multi-purpose ice arena. When no other facility is available, it is possible to curl on such a surface.

General Appearance of Interior

As has been stated, the overall general appearance and standard of arena upkeep has a strong and definite relationship to the basic construction materials, type of materials, their appearance and colour. A shabbily constructed arena of the cheapest possible or unsuitable materials, deteriorates quickly and is

much more subject to vandalism and abuse than a high quality structure. While this statement has been made many times, in many places, its significance is not realized or appreciated by far too many building committees. With high labour and maintenance costs in today's economy, the implications cannot be over-emphasized.

ARENA MANAGEMENT AND OPERATION

As in any other enterprise, the management of the day-to-day operation is a major factor in the success of any arena. The vast majority of arenas in Ontario are owned and operated by the local municipality under direction of a board of citizens. Should financial aid be obtained from the provincial government through the Agricultural and Horticultural Societies Branch, Department of Agriculture & Food, Parliament Buildings, Toronto, then it is mandatory that such a facility be managed by a board as stated in Section 6-(1) of the Community Centres Act:

"Every community centre established by a municipality under this Act shall be under the management and control of a board appointed by the council of the municipality and composed of not fewer than three persons who are qualified to be elected as members of the council and, where the board is composed of five or more persons, at least two shall be members of the council."

The regulations under this Act state that a community centre may be a community hall, an athletic field, indoor or outdoor swimming pool, skating arena or outdoor skating rink. Such a board in charge of an arena is often referred to as the arena's board or commission. In addition to this group, a community may have a recreation board, and a parks board. The arena manager may also serve as the community recreation director, or in a dual capacity. To serve two separate boards can offer certain administrative problems to an individual serving in this double role. Ideally, the arena, parks and recreation boards are united to serve the community in a broad recreational sense. In the final analysis, the arena activities are part and parcel of the community recreation program and are coordinated more easily by one board than two or three.

Many communities now invest this total responsibility for arenas, parks and recreation, in one commission, or if 2 or 3 boards or commissions are appointed, they are made up of the same personnel. This avoids many conflicts and issues between boards, all at the public expense.

On the other hand, there are many communities that have two or three separate boards. An arena manager—recreation director may carry out his responsibilities under these conditions if his work load is clarified and clearly understood by the boards in question.

In a community lacking sufficient funds to employ a full-time manager, the arena commission must assume administrative responsibilities, not expected in a community where a full-time employee is available for these duties. An ice-maker is employed for the winter season in such a situation, such a person also

being custodial authority for the arena.

In a situation where a full-time arena manager is employed, he acts as the executive-secretary to the local commission or board and is held responsible for all normal administrative policies as directed by the board. Most arena managers in the Province of Ontario, as well as many recreation directors, have completed the three-year in-service training course in arena management, sponsored by the Ontario Arenas Association in co-operation with the University of Guelph.

The manager has overall responsibility for the general business aspects, ice maintenance, and the concession operations (leased or self-operated) as his main duties. The board of commission defines policy, approves all budgetary matters including ice and rental rates, and acts as the final authority in all matters affecting the operation of the facility.

Staffing

The number of personnel employed on a full or part-time basis may vary from one to one hundred depending upon scale and scope of the arena program. In even a one-man operation, the operator should hold at least a class B refrigeration operator certificate as issued by the Department of Labour of Ontario. While this is not mandatory in arenas with a refrigeration unit of 50 h. p. or less, this requirement is still judicious for the most efficient and safe operation of an ice-plant. A class B certificate entitles an operator to act as chief operator in a refrigeration plant not exceeding 400 registered horse-power, which is within the limitations of almost any ice arena.

An arena board employing a full-time manager usually requires that he hold a class B refrigeration certificate. When the program and activities reach the point of employing an assistant, he too, should qualify for this B rating. Many arenas having three or four permanent staff, including maintenance and operational, ensure that all have this certificate.

There are no specific rules or guildelines as to number of employees, but as a general guide to assist in consideration of future maintenance and upkeep costs, the following table might indicate future approximate personnel needs.

Arena Seating Capacity (not including S.R.)	Manager		Asst. Mgr.	Other Permanent Staff (4)	Casual	
	Winter only	Full-time			Winter (5)	Summer (6)
500	x(1)	—	—	—	1-5	—
1,000		x(2)	—	0-4	1-7	0-2
1,500		x(3)	x	1-4	2-8	0-4
2,000		x(3)	x	2-5	6-12	0-10
2,500		x(3)	x	2-6	7-15	0-10
3,000		x	—	3-6	8-20	0-12+
3,500		x	x	7-11	5-40	0-20+
4,000						
5,000+		x	x	8-13	10-50	0-30+

1. Often hired for winter season only
2. Full time winter only — in summer in recreation division
3. May also be assistant recreation director for both winter and summer activities
4. Includes accounts section, clerks, foremen and maintenance personnel
5. Includes maintenance, concessions ushers, police doormen and labour, etc.
6. Includes ushers, doormen, maintenance, police and labour, etc. May be also used for recreation department events.

Caution is emphasized in the reference to the above table, as every community has distinct features that may alter the staff and labour requirements considerably, the chief one being whether or not there is a recreation and/or parks department which allows a greater opportunity to spread the personnel over a wider range of responsibilities, especially in the summer months. Other permanent help may be utilized only as required for special events or for special maintenance in this building.

Most communities require a full-time recreation director in addition to the arena manager, when the population to be served exceeds 10,000 depending upon local public recreation demands and financial ability. Further assistance and guidance in this matter may be secured through the consultants in the Youth and Recreation Regional Offices, Ontario Department of Education.

Arena Management Training Course

A certificate in arena management may be obtained by annual attendance over three years at a one week training course given by the Extension Department, Ontario Agricultural College, at the University of Guelph, in co-operation with the Ontario Arena Association and its membership. Refrigeration is a portion of the course, allowing an operator to earn both a certificate in arena management as well as in refrigeration, thus satisfying the Ontario Department of Labour statutory requirements as well.

Concessions

The sale of food and beverages is a normal and customary practice in all arenas. The net profits can be significant in the overall revenue totals in an annual operation. The only question that is subject to controversy is in regard to the type of operation of such outlets, as to whether they should be self-operated or leased to a private operator, or a combination of both methods. All arenas, regardless of capacity, operate by one of these systems, there being no generally accepted best method. The final decision must be based upon the particular operation in question, the policy of the local community arena commission, or the policy of the civic council itself. The following might assist in resolving this question.

Many smaller communities allow a local service club or similar organization to operate the arena concession. The profits accruing to the club are then turned back into the facility by donating this money to the arena debenture obligations or capital equipment purchases, renovations, extensions, or even the current operating budget. This system allows the arena board relief from supervising the concessions, and ensures a continuing interest by a local community organization. In other small communities a committee of local citizens accepts responsibility for the concessions, and using any profits in a similar fashion to the service club. The main disadvantage and problem encountered in both of these systems is an inefficiency resulting in food wastage or spoilage, over-stocking or lack of stock, with a resultant loss of profits. Food concessions improperly handled, can lose money as easily as they make a profit. It is often only due to the fact that voluntary help is used in both these methods that any net revenues are realized. Large urban municipalities operating small participation type arenas in various districts of the city, tend to lease or self-operate the concessions on a system that relates to concessions at other facilities, allowing greater efficiencies.

It should also be recognized that reasonable profits are realized in many smaller arenas. There are numerous examples of 1,000 seat arenas grossing $10,000 or more per season from the concession operation, or 700 and 800 seat arenas

realizing $6,000 to $8,000. The net profit depends upon the entrepreneurial skills of the voluntary operators and also as to whether a rental is charged against the concession gross revenues. In a voluntary arrangement, rental is not a normal by-charge.

SELF-OPERATION VS LEASING

1. Self-operation

   A. Advantages

      1. Quality of service can be given top priority over profit
      2. Complete control in all staff and personnel matters
      3. Complete financial control of all transactions
      4. By owning equipment, no problems involved in releasing staff or considering leasing if thought advantageous
      5. Tight control of all stock and records

   B. Disadvantages

      1. Private lessee has to make profit and often more efficient as to use of staff and stock
      2. Large capital investment may be required in equipment
      3. Personnel matters can use up an inordinate amount of time
      4. There is often spoilage and wastage of stock with a resultant loss of profit
      5. Patrons consider arena and concessions are the same operation, so tight controls essential by arena management
      6. Stock-taking can be time-consuming and tedious
      7. Stock purchases liable to be relatively small, with lower mark-up possibilities than if large scale wholesale purchases

II. Leasing

   A. Advantages

      1. Profit is essential, but quality must be considered for greater profits
      2. Large scale stock purchases possible with considerable savings and more fresh products
      3. If other concessions operated, less wastage and spoilage as stock is removed for sale at other outlets in municipality

4. Large capital investment may be responsibility of the lessee
5. All personnel matters dispensed by concessionaire

B. Disadvantages

1. Profit motivation may lead to inferior or poor quality stock
2. May be difficult to assess financial aspects and hence % of profit to be paid arena management
3. If operator owns equipment, it can be difficult to replace him if so desired, especially in mid-season.

There are several arrangements in Ontario arenas that could be considered unique, or at least non-typical from the normal outright leasing arrangement. The lessee supplies all the equipment and maintains it, while the arena provides utilities and employ and pay the staff. In return the arena receives an agreed upon percentage of gross revenues that may reach 33% in some cases. Similar arrangements in other arenas provide all revenues from certain items (i.e. popcorn and cigarettes) go to the lessee and percentage is paid on all other items. The arenas under such contracts are very satisfied with these arrangements, as are the lessees.

Ontario arenas tend to operate concessions on a self-operated basis, mainly because of control on staff and service and the presumably greater profits. This assumption is subject to much closer scrutiny than is given by most operators. In many cases, net profit is discussed with no deductions for maintenance and upkeep, insurance, depreciation, managerial time costs, etc., and is therefore quite unrealistic. If an operation is sufficiently large to warrant a reasonable time allocation to the concession operation by a permanent staff person, such as the assistant manager, then there is much more justification for self-operation in a large arena.

Generally speaking then, smaller capacity arena concessions are self-operated, often by local voluntary help or a service club. Small to medium arenas may employ one woman on a paid hourly or season basis, medium to large arenas self-operated or on a leased basis. While it is difficult to generalize as to the best method of operation, it has been accepted that a well run, high volume concession can be quite profitable for the self-operator. More serious overall financial consideration could be given by many marginal or low profit operations to a leasing arrangement with a reputable well established concessionaire operator, with a definite possibility of higher net returns and fewer managerial problems. Essential in any leasing arrangement, is a concise and clear cut contractual agreement that is positively and definitely enforced. The general public always associate the concession service and quality with the arena management. Therefore, for the sake of good public relations, such definite agreements are critical.

● Annual Operating Costs

No arena structure should ever be considered that has not had the annual operational expenditures and revenues seriously considered. There have been far too many costly oversights in this regard in many municipalities. There is also a definite history of over-estimating potential revenues and under-estimating the annual expenditures. The depreciation and debenture charges are often overlooked in these original estimates.

● General Guide to Expenditures

As a general guide to annual operating costs, the following expenditures are usually calculated for any arena operation, large or small, the individual items depending upon the local conditions.

PRINCIPAL ANNUAL ARENA EXPENDITURE BREAKDOWN

Salary - Manager
Assistant
Office Staff

Wages - Permanent
Casual or Part-time staff

Unemployment Insurance

Group Insurance

Workmen's Compensation

Hospitalization

Insurance (Building)

Office Supplies & Stationery

Bank Charges & Interest

Telephone & Telegraph

Water & Sewer

Electricity

Natural Gas or Oil

Equipment Maintenance

General Supplies

Cleaning Supplies

Maintenance & Repairs to Building

Advertising

Sundry Expenses

Debenture Charges

Building Depreciation Charges

Bad Debts

Accounting & Auditors

Depending upon local accounting practices and type of operation, other items such as reserves for building and equipment maintenance or purchase may be included as well.

PRINCIPAL ANNUAL ARENA REVENUE SOURCES

Hockey - Senior
- Intermediate
- Minor

Ice Rentals - Hockey practices and other uses

Public Ice Skating

Figure Skating

Banquets and Receptions

Special Events - Wrestling, Ice Shows, Dances, Bingos, etc.

Roller Skating

Skate Sharpening

Check Room

Concessions

Other possible sources of revenue include pay telephone, office space rental, bond interest, grants and donations, window rentals, or in some arenas, tax levy from the local municipality as a form of subsidy.

As a guide to anticipated expenditures, the following chart may assist in estimating future arena costs.

Maintenance Costs Shown on % Basis

Classification of Major Expenditures	Seating Capacity 500-1,000	1,000-2,500	2,500+
1. Wages & Salaries Including fringe benefits, compensation, etc.	40-60%	30-40%	33-40%
2. Office Expenses & Upkeep	1-3%	2-4%	2-5%
3. Insurance	2-5%	2-6%	2-4%
4. Utilities — Fuel, Light, Water, etc.	5-15%	6-12%	8-12%
5. General Maintenance & Upkeep Costs	40-60%	45-55%	36-40%
6. Other — Debenture Charges Dep'n. etc.	Varies	Varies from 5-25%	Varies

Expenditures in a smaller community of 3,000 to 6,000 persons for a 700-1,000 seat arena vary from $9,000 to $20,000 or more depending upon location of the town, number and type of activities, rental rates and number of outside users, all directly affecting possible sources or means of revenue. An arena of 1,000-2,500 seats in a community of 5,000 to 20,000 persons may have an annual expenditure of from $20,000 to $45,000 or more, while an arena of 2,500 seats and over may vary from $45,000 to $150,000. An arena with a seating and standing capacity of 6,000 to 8,000 may have an expenditure of several hundred thousand dollars, especially if the arena is part of a larger exhibition complex operating on a full year-round activity basis.

As an example of an efficiently operated arena, the following is a guide of expected revenues of a 1,200 seat arena in a town of approximately 7,500 persons.

Revenue (approximately only)	
Concessions (net)	15.75%
Ice rentals	70.30%
Public skating	11.15%
Miscellaneous rentals	.96%
Skate sharpening (net)	1.24%
Miscellaneous income	.60%

In this example, a debenture of over $6,500 is paid out of revenue resulting in excess of revenue over expenditure of just under $7,000. There are other examples that show a lower revenue requiring a subsidy from the local municipal tax base of from $3,000 to $8,000. Many municipalities assume the annual debenture charges of the local arena, not including this item in the normal annual operating expenses.

Other Sources of Revenue

Many arena planning committees are much too optimistic as to potential off-season, or summer sources of income. Unless an arena is of sufficient size, scale and of a high architectural quality to attract people to local or professional entertainment, the summer season should be considered realistically as a very low or minor period of income. This statement is accurate for even fairly large, well managed arena buildings. In Ontario, generally speaking, most persons prefer to be out of doors during their leisure hours, especially during the vacation season.

Certainly, there are exceptions to the above generalization. There are some communities where roller skating is both popular and profitable, while twenty miles away, the same activity is marginal. Many special events are risky promotional affairs, with great competition for the leisure dollar. Many medium to larger cities now hold home shows and sportsmen's shows in April to June, and do not rely on any major activity in July and August.

Summer hockey schools, properly promoted and managed can be a good source of summer revenue.

Roller skating may require an investment of $3,000 to $5,000 in skates and requires good supervision to be an attractive event in a community. A terrazzo or trap rock floor is required for such an activity. Boot type skates are now found to be necessary for rental purposes.

It should also be realized that the major shows that appear in the larger arenas and cities, travel on a pre-arranged circuit, usually demanding a certain basic fee and/or percentage of the gate. It is only the larger operations that can afford to enter into such negotiations and subsequent financial risk.

Before special events are considered either for winter or summer, most careful study and review of experiences in other municipalities should be undertaken.

ACTIVITIES AND PROGRAM

Arena design is directly related to the intended future function, both for winter as well as summer activities. It is well to recognize the various events or programs that are possible, and also to realize the limitations inherent in any arena structure. Too often these limitations are completely by-passed or not considered.

Essentially, the arena is designed to provide an ice cushion under a protective covering for various winter activities. Other intended uses, of necessity, must be considered secondary in terms of the principal intended uses. As a result of this, many ideas and activities are not suitable for consideration in such a restricted structure. There is a definite tendency to over-estimate the program and activity possibilities for the summer months, and the consequent amount of revenue gained in this period. Summer or "off-season" activities and special events must be carefully planned and promoted in order to be successful. Grandiose schemes of indoor tennis court games, roller skating, dances and similar events are often complete failures with resultant financial losses. An indoor arena, if not a cheerful, well-lighted and colourful interior can be a drab, unattractive place to visit on a warm summer evening.

Winter Activities

Most winter activities are very similar in content in most arena operations, there being a major difference only in commercialized large spectator type facilities common in municipalities of at least 30,000 persons or more, or in a region that contains at least that number of persons or usually more. In larger types of arenas, various non-ice events infringe upon normal ice programs. Minor hockey is often given a very secondary preference in these larger commercialized arenas.

Table II

Typical Winter Uses — Small to Medium Ontario Arenas (1)*

Activity	Avg. hrs./wk.	Avg. %/wk.
Senior hockey (2)*	7)	66%
Minor hockey	30)	
Rentals	3	5
Figure Skating	12	15
Public Skating	7	12
Special Events - Ice Show	1	2
Total	60 hours	100%

(1)* Compiled from a sampling of selected Ontario arenas.

(2)* Senior hockey refers to an adult senior men's hockey league while minor includes all ages up to adult local hockey participation, including industrial type leagues.

Novelty features, such as senior adult skating (over 50) featuring waltz music, one night per week, or mother and small children skating one or two mornings per week have proven very popular in some Ontario arenas. Schools often take advantage of an indoor arena facility during the daytime hours. Most small to medium-size arenas do not cater to non-ice activities in the winter months.

Table II illustrates the average hours per week, as well as the average per cent per week of various winter arena activities. This table should only be used as a general guide for arena operation, as local conditions may alter these hours per week use considerably. For example, some arenas are in constant demand from senior men's hockey teams for practice rental use. This could result in a much longer hour per week schedule, and of course, much higher income. Some arenas, in larger urban areas may rent the ice at virtually any hour, due to the great demand.

Table III shows the various activities and special events that have been promoted in various medium and large arenas in the province of Ontario, in the summer months.

Table III

Indoor Arena Summer Events

Bingo	Antique Show)	
Country & Western Shows	Carnival)	
Wrestling	Dog Show)	
Circus	Fashion Show)	
Home Show	Roller Skating)	Antique
Furniture Show	Summer or Fall)	
Automobile Show	Exhibition)	
	Lacross)	
	Dances)	

Events such as bingo, a circus, may be held during the winter season as well as the summer. Most arena operations do not attempt to sponsor or promote these types of special events during July and August due to general lack of public interest during the so-called vacation months.

Small Arenas

Some smaller size arenas hold certain special events, but due to lack of seating, or a difficulty in staging events, where perhaps a stage or special lighting is

Meeting-room

Multi-purpose
Arena

required, these events are normally held in arenas seating 1,500 persons or more. The advisability of holding such events is a local matter, and no general rule can be quoted. The local recreation commission may take advantage of the local arena for summer rainy day playground purposes, or for court games.

Roller Skating

Roller skating has been carried on as a summer event or activity, very successfully in some communities, while other communities have shown little interest in this sport. Improved roller skates have helped to instil a renewed interest in roller skating in the last ten years, as well as terrazzo or trap rock floors which facilitate the skating and reduce the dust problem common on wooden floors.

The most careful assessment of local summer activities and potential interest in roller skating should be undertaken before proceeding with this activity. The purchase of roller skates may require an investment of upwards of three to four thousand dollars, or more, and there may be considerable upkeep and maintenance required to keep the skates in rentable condition.

Rental Rates

Winter Rates — The rate for ice rental for various activities varies considerably, depending upon the size of the community and region, the demand from local and non-local hockey or figure-skating clubs, the promotional success of the arena board, and the accommodation and quality of dressing rooms and other facilities. The amount of current expenditures that must be met, annual debenture payments or obligations, the scope of the arena operation, are also major criteria that determine ice rental rates. As a guide to this question, ice rental rates would appear to be set in direct relationship to overall annual current expenditures. Arenas that manage to operate on a budget as low as $12,000 to $15,000 per year, may charge as little as $5 per hour for minor hockey or figure skating. Senior hockey teams normally pay at least $6 to $12 an hour for ice time in a low overhead operation. Arenas with an operating budget approaching $25,000 to $30,000 may charge a low of $6 to $15 an hour. Larger operations may charge up to $25 or $30 an hour or more, depending on the type of activity and demand. In the great majority of cases, rates are substantially lower for minor hockey and children's figure-skating clubs, especially if the ice time is before 6:00 p.m. or during the week-days.

The rates often vary between local and non-local participation by groups or teams,

the local teams being charged a lower hourly rental. There are few arenas in Ontario that do not charge an hourly rate for the various activities. The total revenue received from these sources, along with other secondary sources (concessions, checking, skate-sharpening, etc.) must meet current annual expenditures. This annual expenditure total, in the final analysis, is the determinant of the hourly rental rates in an arena operation. No general rates may be laid down, due to the difference in these expenditures in each and every community.

Summer Rates — Most arena summer events are of a special event nature, excepting community or public recreation programs within the building (playground wet day programs, court games, roller skating, etc.) The charge for these events may be broken into two categories:

(i) Events sponsored by the arena board
(ii) Events sponsored by "outside" groups

The arena board may promote certain events at which a direct charge is made to the individual patron and any profit or loss is absorbed by the arena management or board. Events such as dances, wrestling, or roller skating, etc., could be included in this category. Often an arena board may sponsor certain fund-raising events to help meet debenture or loan repayments.

The most common rental procedure used when the arena is rented by a service club, or any private or "outside" organization, is an agreed upon guaranteed rate for that event. This may vary from a minor amount, to several hundreds of dollars in a small or medium arena. In some cases, a "percentage of gross take" method is used; especially for service clubs or non-profit community organization.

There are communities in which a service club, in recognition of their initial arena fund-raising efforts, are given the arena at no charge for one or several nights per year. Often the surplus funds from such an event are returned to the arena in capital or in the form of renovations, repairs, equipment or perhaps a new addition to the building, depending on local needs.

Should roller skating be part of the summer program, rental rates of up to 50¢ per participant are acceptable, while a lower charge is made to those persons using their own skates. An admittance fee is also levied.

● General Comments on Summer Activities

The arena committee should recognize certain factors in the determination or

expectations of a summer program or special events. Indoor summer arena events or programs are often poorly supported and may result in a financial loss. The major reasons for this may be -

1. inadequate program planning
2. lack of, or, improper leadership
3. competition from other attraction
4. desire to be outdoors during the short Ontario season
5. unattractive and unpleasant arena interior
6. various other reasons of a local nature

There would appear to be a strong correlation between the type and quality of the arena interior and the success, or lack of success, of an event or program. A pleasant, colourful, well-lighted, well-maintained, clean arena is considerably more conducive to better attendance and patron support than one that is drab, colourless, poorly lighted, and poorly maintained. Arena boards should realize that events staged in the arena are in direct competition with a host of other community and home attractions that may provide a much more pleasant environment. The use of proper building materials, paint colours, floor materials, lighting, exterior appearance and, above all, cleanliness, are of critical importance in the planning of events and programs, expecially in the summer months.

MAINTENANCE AND UPKEEP

The ease and convenience of arena maintenance is a direct reflection upon the building design and type and quality of materials included in the construction of the arena. Substantial savings in annual upkeep are often a direct result of superior building materials. Costly renovations can be avoided by careful consideration of future arena activities and the internal and external traffic flow generated by the arena program.

We discuss here only those aspects of maintenance that are directly affected by materials and/or design features. The total subject of maintenance and upkeep is too large a subject for inclusion in this booklet on arena planning and design.

● Painting

The use of newer materials that do not require painting, or less frequent painting, have been of great interest in arena operation. The labour costs involved in paint application far exceed the actual cost of the paint materials. Materials that eliminate painting or other treatment as an ongoing cost are: glazed tile, brick, trap rock and terrazzo. While the initial cost of these materials is admittedly higher than more conventional materials, the upkeep costs are substantially lower and their life-span can be much longer as well.

● Floors

Concrete floors, if not painted or sealed and waxed, are a constant source of dust, as well as presenting a depressing appearance. Concrete can be covered with floor tile, trap rock or terrazzo. It can also be finished with a coloured additive which can then be sealed and waxed. Floors must be cleaned very frequently in order to present an inviting and clean appearance. Good quality flooring tile is receiving increasing installations in arenas and appears to withstand severe use (ice skates) very well. When a tile is damaged it can be replaced. Rubber belting, and even plywood, is often used on floors to protect skate blades. Hardwood should never be used in general corridors and dressing rooms as it is extremely expensive to maintain properly. If used, it can require sanding and refinishing every two years. In some older arenas cracked and heaved floors are brought to a more even grade by using sawdust as a filler prior to making ice.

● Walls

The walls of a public building, such as an arena, are subject to abuse and misuse.

Orderly
Storage
Reduces
Problems

Walls can be constructed of glazed brick or tile, glass, concrete block, glass block, brick as well as different types of wood or metal. Concrete block is most common and virtually indestructable. Glazed brick is expensive but, used at the exterior entrance, is a superb appearing material. Concrete block can be painted with plastic type paints with good results. Wooden walls, especially on the interior of dressing rooms are subject to vandalism. Concrete blocks or bricks are the best materials for interior or exterior walls for most types of arenas because of their fire resistance qualities and durable character to supplement their primary purpose as a bearing wall.

Boards and Ice

The hockey rink boards will normally require paint prior to every seasonal use. If the arena is used for spring and summer non-ice events, the boards may require "freshening up" after the hockey season as well. The puck board is sometimes painted 2 or 3 times during the season. Boards are usually painted a white or light colour, the puck board a brighter colour such as red or orange. Some operators paint the red and blue lines on the floor of the arena in the off season to indicate their position. This can save time in the winter months as these lines act as guidelines to ice paint application.

Seats

Good quality flip-up seats can often last five years or more between painting. If the seating is merely planking secured to concrete or wood risers and therefore subject to considerable foot use, paint should be applied once a year.

Seats can be subjected to much abuse and wear if skaters are allowed to use them during public skating hours. This should indicate the validity of large gates connecting corridors and the ice surface with a pleasant change area. Strict control is necessary to enforce any ruling regarding skaters using the general seating area.

The best quality seats are a flip-up hardwood seat and back on a steel frame. These seats are available individually or in sets of two seats per frame. Seat backs can be curved or straight. Medium quality seats are bench-like in character and do not flip or pivot when not in use. The most simple type seat is merely planking secured to a wooden or concrete riser with no back rest.

Showers and Washrooms

Shower rooms are difficult to maintain for good appearance. Ideally, shower room walls are constructed of ceramic or glazed tile. Many arenas use a plastic based paint on the concrete walls and re-paint as required.

Washrooms receive more than a normal amount of vandalism. Experience has shown that marks and writings on walls or other abuses are reduced by using durable tiles or metal walls and partitions. If concrete block is used for walls, frequent painting to cover up any marks assists in keeping a clean and fresh appearance, reducing the tendency for vandalism.

General Maintenance Comments

Cleanliness and neatness are prime requisites to successful arena operation. An orderly and safe arena reduces the possibilities of personal injury and public liability damage claims, as well as presenting a pleasant appearance.

Paint should be applied whenever the appearance of an area of a particular location shows obvious signs of wear and tear. The foyer and principal areas of use, such as corridors and dressing rooms should be painted once a year. If materials not requiring paint are used, then frequent washings are required to keep a neat appearance.

Counter tops in the concession areas should be covered with formica or a hard durable water-impervious material, preferably of a cheerful colour.

Glass block is often used in walls to allow light penetration. There is often little validity for its use. Glass windows are a severe detriment if placed in the main arena to allow sunlight in and hence ice-surface melting when it reaches the ice. Even if windows are placed in various locations they must be screened by burglar-proof mesh, and often painted to reduce sunlight penetration.

Dressing-room
Fittings

APPENDIX I

PRECAUTIONS

● Dressing Rooms

Dressing room benches or seats should be affixed to the walls by steel angle brackets, using bolts rather than wood screws. Benches should be hardwood and at least 20" in width.

Clothing hooks in dressing rooms should be made of steel in a J shape, and welded to a steel plate, which in turn is bolted to the concrete block wall.

All rooms, especially dressing rooms should have floor drains and floor sloped sufficiently to permit liberal use of water from a high pressure hose for cleaning purposes.

There should be adequate water bib connections in corridors to facilitate cleansing of all floor areas in the arena.

One well ventilated room should be provided for hockey equipment storage, for sanitary reasons.

Rubber belting, or floor tile should be laid over concrete floors in the dressing room and corridors on the specific areas used by the players to avoid damage to skate blades and to the floor.

The ceiling should be of a durable material to prevent objects (hockey sticks) penetrating and defacing it.

Vandal-proof protection should be given to any thermostat controls, light switches, water taps, or similar mechanical equipment in any public area.

All doors should be metal or metal covered to reduce the possibility of vandalism.

All windows should be eliminated in dressing rooms. If windows exist, replace with fibreglass to reduce breakage. Natural lighting (if required) may be supplied in some cases by an overhead transom. Exhaust fans can provide excellent ventilation in a windowless room.

Showers may be fitted with temperature controlled and/or automatic shut-off heads to reduce water wastage. A push button is much less subject to damage than conventional taps.

Dressing rooms on different levels than the main floor that require stairs, can lead to falls as well as creating problems in moving equipment or cleaning up and down a staircase.

Ice Cushion & Boards

The puck board should be hardwood, preferably oak.

Heating ducts should not be placed in close proximity to the ice surface edge to prevent undue melting from radiation.

A large well-drained ice pit (for snow removal purposes) should be provided with removable screens on the ice pit drains for cleaning. If ice pit is at the ice edge, avoid curb at this location.

Sufficient drains should be provided for ice removal and water drainage, preferably at the side of the ice cushion.

The ice surface and the floor of the equipment-gate should be at the same grade to permit easy access to the ice cushion.

Large gates should be provided for public skating with direct access to corridors and change areas.

Inserts should be provided on the main floor for summer court games.

Electrical and telephone wiring should never cross under the ice cushion.

Adequate height (min. 14') and simple access should be provided for a loaded vehicle to be driven on to the main floor for equipment moving (chairs, stage, etc.).

All gates to the ice surface should swing away from, not on to the ice surface.

Ice clearing equipment (mechanized) should have ready access to the ice surface. Ice clearing equipment should be stored in a heated area for maximum operating efficiency.

Mechanical Equipment

An evaporator condenser should be considered if water costs exceed 20¢ per thousand gallons.

A complete log book should be kept following the manufacturer's instructions.

A pre-season, mid-season and post season check of all refrigeration equipment should be part of a preventive maintenance program.

The evaporator condenser requires maximum freedom of air circulation. This equipment should be located outside the building, within a fenced enclosure. If placed indoors, such equipment is subject to excess humidity problems and subsequent freezing.

General Building - Exterior

There should be adequate roof overhang with roof drains outside the building and protected from possible vandalism. Electrical cables in the eaves prevent ice build-up.

All exterior doors should be designed to avoid drainage problems and ice formation.

If there are external vent pipes, they should be insulated.

It may be found necessary to treat exterior concrete walls to ensure water-proofing.

Large expanses of glass should be avoided to reduce cleaning time and breakage possibilities.

General Building - Interior

All concrete floors should be either painted, or treated and waxed as often as necessary to prevent a shoddy appearance; untreated floors are a constant source of dust, a high upkeep factor, and offer an uninviting appearance. Terrazzo, trap rock or tile floors provide the best floor from both the appearance and upkeep point of view.

All corridor walls should be colourful and cheerful in appearance. Glazed tile is often used, but if the walls are painted, a plastic-based paint helps reduce damage from marking on walls.

If standing room is provided at the top of the seating area, a guard rail should be provided that is high enough to prevent interference between those persons seated in the back row and those persons leaning over the railing.

Sufficient storage space is essentail to proper arena maintenance efficiency. This applies to custodial supplies as well as other necessary equipment (chairs, mechanical and stage equipment, etc.).

Heating should be provided to at least one large area in the arena, preferably in the same location as the concession outlets, to allow a between period warm-up for fans.

Collapsible scaffolding is required for light replacements.

APPENDIX II

CONSULTANTS — YOUTH AND RECREATION
REGIONAL OFFICES, ONTARIO DEPARTMENT OF EDUCATION

		Serving:
REGION 1	10 Water Street Thunder Bay 344-9601	District of Thunder Bay and isolated communities in Patricia
	18 King Street Dryden 223-2271	Districts of Kenora, Rainy River and southern Patricia
REGION 2	1349 Lasalle Boulevard Sudbury 566-3480	Districts of Algoma, Sudbury, Manitoulin
REGION 3	240 Algonquin Avenue North Bay 474-7210	Districts of Muskoka, Temiskaming, Parry Sound, Nipissing and Cochrane
REGION 4	759 Hyde Park Road London 73 472-1440	Counties of Middlesex, Elgin, Kent, Essex, Lambton and Huron
REGION 5	279 Weber Street North Waterloo 576-2512	Counties of Waterloo, Perth Wellington, Oxford and Brant
	374 Seventh Avenue Box 340 Hanover 364-1626	Counties of Grey and Bruce
REGION 6	15 Church Street, Suite 402 St. Catharines 684-1123	Counties of Lincoln, Haldimand Norfolk, Welland and Wentworth
REGION 7	40 Eglinton Avenue East Toronto 315 365-5026	Counties of Simcoe, Dufferin, Halton, Peel, City of Toronto, Boroughs of Etobicoke and York
REGION 8	Heron's Bldg., Suite 3201 2025 Sheppard Ave. East, Willowdale, Ont. 491-0330	Counties of York, Ontario, Victoria, Haliburton, Boroughs of North York, East York and Scarborough
REGION 9	1082 Princess Street Kingston 546-2641	Counties of Lennox and Addington Frontenac, Leeds, Grenville, Renfrew
	220 Dundas Street East Belleville 968-9800	Counties of Durham, Northumberland, Peterborough, Hastings, Prince Edward
REGION 10	1320 Carling Avenue Ottawa 3 722-6534	Counties of Lanark, Carleton, Russell, Prescott, Dundas, Stormont and Glengarry